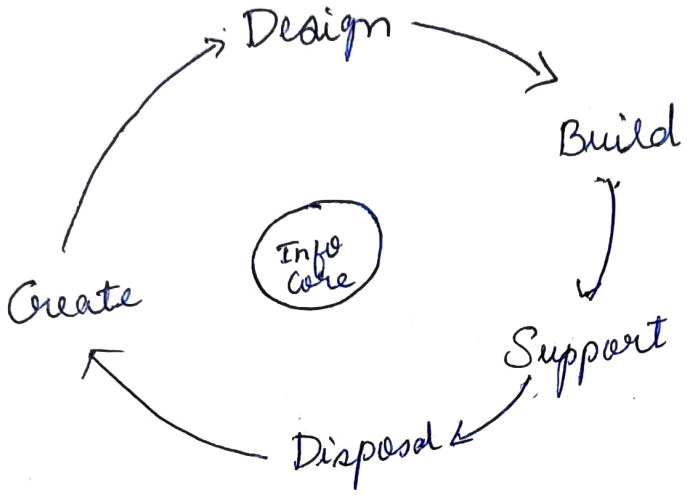
November 2020

Product Life cycle Management

1. a Explain different phases of PLCM with neat sketch.



There are 5 phases in PLCM

① Create

* It starts with product requirement analysis & planning
* Major ~~th~~ technical parameters of product are defined & mapped into specifications
* In parallel, intial conceptual design work is performed by defining aesthetics of pdt with main functional aspects.
* First phase must ensure that all components that make up the product.

(2) Design

* It is based on conceptualization of Product.
* It takes into account details of how product will perform its intended function in an efficient, safe & reliable manner.
* Product also needs to be capable of being made economically.
* In some cases, prototypes of model are also designed
* It is important to ensure at this stage that all components fit together in an integrated system.

(3) Build

* It involves method of manufacturing the product.
* Design of pdt must be analysed & BOM must be procured
* Later Bill of proces must be developed to specify various operations
* Once Components are manufactured, their geometrical form & size are checked & Verified as per design specifications

(4) Support

* Support team initially builds awareness of product among potential customers through advertisement, personal demonstrations or by any forms of idea.
* Role of supporting team extends to many activities from strategic to tactical skills to promote, market & sell the product.

(5) Service

* It involves servic & support information for repair & maintainance as well as waste management
* There is an ende of life to every pdt, whether it is disposal or destruction of material objects
* If pdt reaches end of life sooner than expected, analysis need to be done in order to prevent such a short life by considering various factors.

S

1.b Explain Compents of PLCM (4)

a) Product & Product data

* A product is a single part of no of parts assembled together in order to perform a certain objective

* Product data includes all data & information related both to product & process that are used to imagine, design, produce, use, support & dispose the pdt.

* Pdt data is created in suitable format, making use of computers & related softwares, so that data can be used throughout pdt lifecycle.

b) organizational structure

* It refers to the way that an organization arranges people & jobs so that its work can be performed & its goals can be met.

* Within organization, structure might consist of individual departments with specific names like production department, Quality, human resource, marketing etc.

(c) Business process & Working methods

* It can be imagined as set of related activities or tasks
* These inputs are made up of all factors which contribute to added value of service.
* This factors are catagorized into mgmt process, operational process & supporting process.
* Mgmt process govern the operation of particular organizations system.
* Operational process constitue core business
* Supporting process supports the core process
* Working methods describe regarding specific instructions on how to specify perform a work. related task or operate apiece of plant or equipment.

(d) Information Systems

It is made up of people, process & technology.

People

* It requires participation of many people of various skill from an extended enterprise, each requiring ability to access & operate on inputs & output of other participants.

Processes

It refers to a procedure or particular course of action intended to achieve result. In each phase of plt lifecycle there are processes which may be specific to a plt or project.

Technology

It refers to collection of techniques, skills, methods & process used in production of goods or services. The IT in ~~plm~~ PLM includes data or information from manual paper cards & records to sophisticated computer & S/W applications & systems.

(e) Interference & Standards

* PLM product interface allows access to documents, design data & other information in controlled manner thereby allowing a better communication
* PLM solutions support a wide range of Critical standards issued by government regulatory bodies, professional engineering manufacturing, Quality & environmental societies

2. a Explain in brief basic components of PDM system

PDM system consists of

(i) Electronic Vaults

It is used to store data & also control it. Both internal & external data collected about pdt can be stored & can be accessed at any pt of time. There are 2 types of data

* Product data

This is produced by various applications such as CAD, CAE etc

* Metadata

It is the data about data. In PDM system meta-data stores data related to PDM controlled Information.

(ii) User Functions

This are divided into following categories

* Document Management

This ensures pdt data is correct & uptodate protected by simultaneous modifications by several users & retrievable at any time.

* Process of work-flow management

It manages & defines product configurations, part definitions, relationships between data & data versions. It also controls review & approval of pdt data.

* Product structure mangement

It facilitates creation & management of product configurations, part definitions, part relationship attributes.

* Classification Management

Classification of parts according to thier attributes provides tools for searching & retrieving std parts & existing pdt data.

(iii) Utility functions

It supports user functions mentioned above & also simplify the use of system for users.
It includes
* communication & notification
* Data transport
* Data translation
* Image services.

(iv) Interfaces

It is connection of data & information between different working systems. PDM applications need to share & exchange pdt data such as part no, versions, pdt cost etc with other applications in company.

(v) Workflow mgmt system

It is a strategy for automating business Workflow process by means of software system. Aim of workflow mgmt is to determine streamline components of various office systems by eliminating unnecessary tasks & costs.

(vi) System administration Functionality

It is used to setup & maintain configuration of system & to assign, modify access rights.

2.b Explain process of Implementation of PLM strategy.

PLM strategies should be defined & implemented in sustainable manner.

It can be implimented in six steps

* Establish objectives & goals for your PLM strategy

Some operational goals include
Centralizing pdt data for better accessibility
Standardizing bills of materials & removing duplicate content
Moving from a paper based to electronic ECO process.

This will give you clear picture of which process need to be more formalized now & which ones can wait until some pt in future.

* Review your process

Review in order to determine if or how they should be mapped to a PLM system.
Take time to review what your doing now & think about how it could be differenent with new system in place

(iii) Review your data

It includes clearing out the unrequired data for ex if existing BOMs & data are managed in excel sheets, spend time in reviewing these files & decide what data needs to be moved & what data can stay where it is

(iv) obtain executive & organizational By Buy in

Executive team can provide motivation & incentives to keep implementation from going askew. They need to be educated about how it is going to make jobs easier.

(v) Work from a project plan & assign project lead

Have a list of milestones with deadlines Clearly delienated will help implementation process move along more efficiently

(vi) Train people on new process earlier

Many PLM systems are easy to use & most have online help systems with plt documentation to answer immediate questions

Web training & classes may also be available to help users achieve individual success with PLM software.

Module - 2

3.a Discuss various steps involved in product design.

Ans * Concept generation

Requirements from potential customers are converted into ideas & later into concepts. Different concepts related to pdt shape, size & functional requirements are developed

* Concept screening

Among number of concepts generated, concept that is most suitable to fulfil requirements are selected.

* Feasibility study

It helps in having closer look of all details of pdt design. This helps to convert into pdt layout.

* Preliminary Design

Product layout is converted into detail design with all the dimesions & specifications necessary to make design specified.

* Design evaluation & Improvement

In this stage examining of preliminary design to determine any requirements for further improvement. There is need to verify in detail the degree to which postponed design matches the design specifications.

* Building Prototype

Prototype of improved design is created for testing & refining the functionality of design.

* Executing Final design

When satisfied with testing performance of prototype, final design is rolled out & displayed to customers for their opinions. Final design consists of detailed drawing & specifications for new part to be created.

3.6 What is ~~Dfg~~ Design (14) for 'x' & list various techniques in design for 'x' system.

Ans :- It is a new methodical approach in product design, where design has ability the strongly influence products performance in every phase of products lifecycle.

Techniques followed are

* Design for Manufacturing

It is principle that proposes design guidelines for manufacturing parts by simple proces

* Design for Assembly

It is a principle that proposes design guidelines for manufacturing parts that makes easy assembling of parts

* Design for Inspection

It makes parts with features that are easy inspect with readily available measurements instruments.

* Design for Quality

Design of components directed at reducing sensitivity of product performance to uncontrollable disturbance phenomena.

* Design for reliability

It aims in improving reliability of constructional unit

* Design for serviceability

Design oriented towards facilitating servicing & maintainance, to favor repair ateexcluding the possibility failure

* Design for safety

It intends in controlling safety standards & prevents malfunctioning during product use.

* Design for environment

Here the process & materials to be selecting in such a way that it doesnt affect environment.

4.a Define Product recycling & its benefits

Ans :- It refers to process by which pdt materials destined for disposal are collected processed & manufactured into new products.

Benefits

* Saves energy :- As more energy is required to extract, refine, transport, & process raw materials to desired shape, size & finish. Recycling saves energy, time & money in making pdts

* Saves natural resources

As it minimizes excavation of fresh raw materials from earths core through mining.

* Protects the environment

It reduces the amount of waste sent to landfills & hence reduces substantial air & water pollution.

* It can generate large revenues

Slight cost savings from recycling helps to reduce product cost, which in turn attracts more customers generating more revenues.

* It enhances business reputation by attracting new customers, enhancing chances of wining - contracts & improving customer loyalty.

4.b Discuss various factors to be incorporated in pdt design.

Ans :- Human factors referred as Ergonomics is the application of psychological & physiological principle to engineering & design of pdts, process & systems.

Design team may consider full human factors for efficient product design.

* Defining all user profils, environments & requirements. Typical descriptions include anthropometric body measurements, age levels & level of user training.

* Identifying & defining the sources of accidents or hazards connected with production & usage of product.

* Adopting an effective design for assembly approach. It includes features that make process easy to assemble/disassemble of components

* Considering the workmanship of product. For example type of finish on product components surface should meet design requirements

* Standardizing hardware & software if any specifically for use of common user interface across buttons, dials, displays.

* Design to accomodate people with disabilities & physical diversity.

Module - 3

5.a Define NPD & discuss the need for NPD.

Ans It refers to all activities involved in developing a new pdt or service, right from its intial conceptual stage to its introduction to market.

Reasons/Need for NPD

* Changes in market requirement, It changes due to varried customer needs, globalized market, heavy competition & availability of no of alternatives

* Technological Change

As advancement in science has led to development of new range of pdts with better performance & costing

* Increased Competition

Due to globalization the companies needs to compet with no of alternative products that are already existing & hence they need to continuously improve.

* Diversification of risks

Each & every pdt launched in market comes with risk of failures & hence company to substant -iate the loss of some pdts comes up with many product varieties

* Reputation & goodwill

To create an ~~impa~~ image & reputation as a innovative & dynamic company, new pdts are developed. Finally attracting new customers

* Utilization of Excess Capacity

It may be in form of production capacity or human skills.

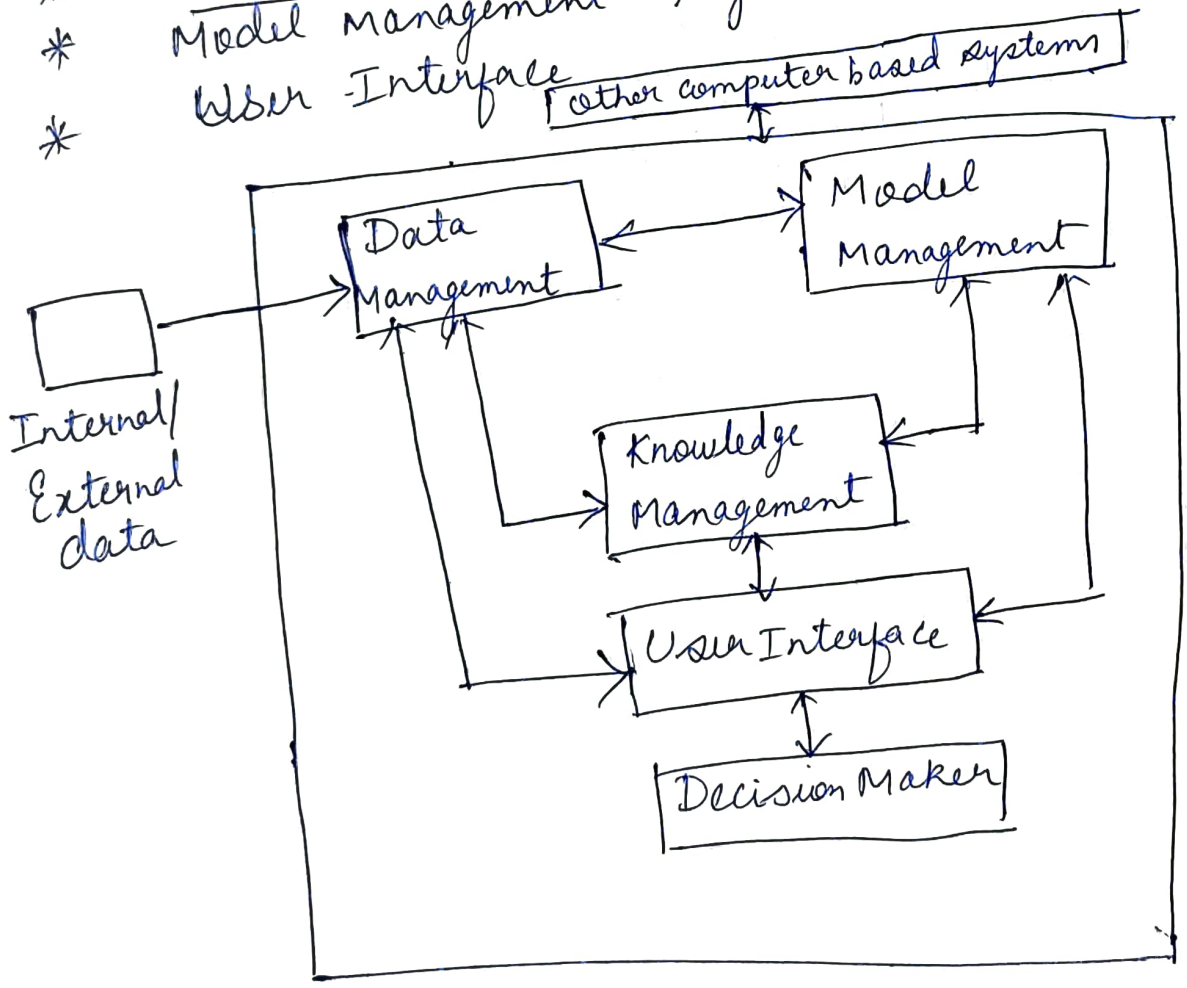
* Growth & development

when old existing products doesn't provide required revenue, Company prefers developing new products to expand its market size & earn more profits

5. (b) Discuss components for building DSS.

Ans. It consists of Three main components

* Database Management System
* Model Management System
* User Interface



(ii) DBMS

It is a S/W package that contains data from various sources, including internal data from organization & external data mined from Internet. Data or Information in decision making is very important

(iii) Model Management System

It uses various kinds of mathematical & Analytical models or Simulations to present & analyse complex data thereby producing required data. A model predicts output on basis of different inputs or different conditions or finds out combination of conditions & i/p that is required to pds desired o/p.

The commonly used mathematical & statistical models are

* Statastical models
* Sensitivity Analysis
* optimization Analysis models
* Forecasting Models
* Backward Analysis Sensitivity Models

(iii) User Interface

It is an interactive graphical interface which makes interaction between DSS & its users. It provides O/P in form of Text, Table, Charts or graphics. User can select appropriated medium to view the O/P.

6.a Explain steps involved in product redesign.

Ans It is often complex process which takes away resources from higher priorities to build new features.

Four steps involved in product ~~Reg~~ Redesign are

(i) Analyse existing Pdt

Feedback from customers, distributors are taken into account & analysed with all perspectives. Customers will be the rich source of info as they are the one who have used the existing Pdt & are aware of drawbacks.

(ii) Analyse Competitive pdts

Identify competitors & analyse thier pdts in terms of features, performance, cost & other attributes. This helps company to determine & weigh thier attributes, assess thier

.. Identify shortfalls in existing pdt & uncover thier objectives & strategies in market segment.

(iii) Bring all geographies & function in one room

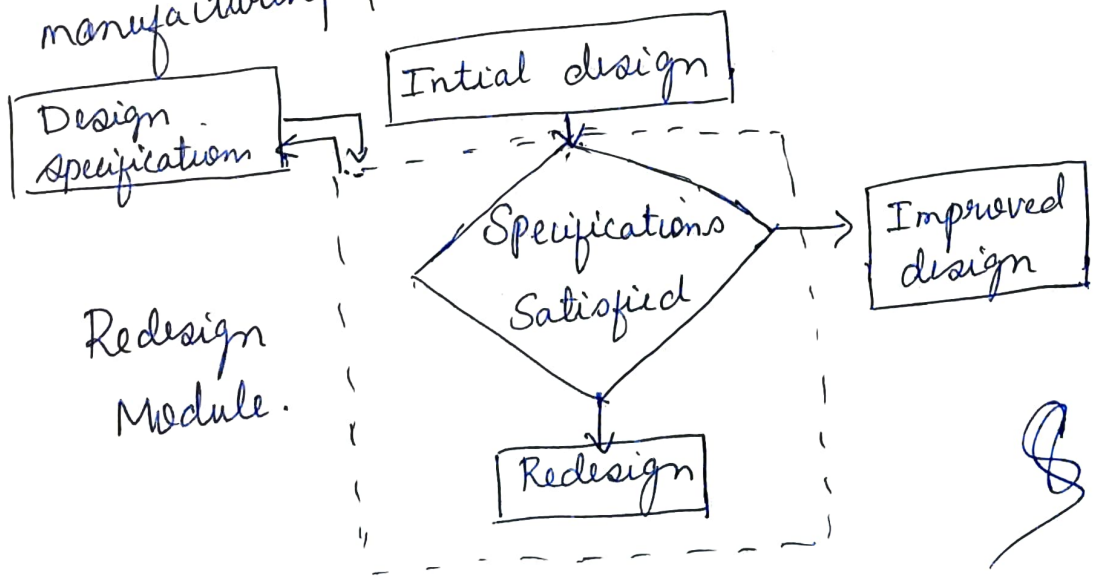
Once product is identified, all geographical business units, different functions need to be brought in one room. It enaures team members challenge products required functions & attributes needs to be changed

(iv) Select a concept for product redesign

By evaluating all the concepts, a final choice is made based on attributes that best fit the requirements, specifications & customer needs & wants.

(v) Establish & refine target specifications

There is a need to refine some issues so as to take into account the various technical manufacturing & economic necessities or limits.



6.b What are different factors for estimating market opportunities for new product.

Ans :- Market Opportunity is defined as need or demand in market that a company can capitalize on by introducing new product or service.

Various factors identified are

* Market Size

No. of Individuals who are willing to buy your product/Service. It is also total market sales potential of all different companies put together. The company needs to perform unbiased evaluation about market requirements. This can be predicted by local search engines

* Market growth rate

It is defined as rise in sales or market size within a given customer base over specified period of time. It is important for companies to know whether market has potential for growth or decline for given product.

* Profitability

It is important to understand market potential. If expected profit is low, then Vol needs to be higher or vice versa. Market potential is based on three elements Return on Investment, Return on sales & Return on net assets.

* Competitors

In order to evaluate opportunities there is a need to know & understand existing competition in market for product being launched. In case of high competition it requires lowering the product price or adding new benefits.

* Product & customer Type

Opportunities can also be found by examining pdt type & customer category. Frequency of product purchase, compared to one-time purchase & seasonal purchase needs to examined to uncover expansion opportunities.

Module - 4

7(a) Define Technology forecasting & state its need.

Ans It is planning Tool applied to predict

→ Potential direction at which technology change is taking place

→ Rate of Technology advance

→ Effects of Technological change on process, plt, etc

Need for technology Forecasting

* Increased competition in global market for innovative & cost effective products
* Survival, growth & profitability of companies need to predict future technological changes
* Identify suitable technologies by evaluating various alternatives
* To provide suggestion for future research
* To invest scarce funds in emmerging technologies
* To analyse effect of technology on socio economic aspects of society

7.b Write short notes on

&

(i) Dolphi technique

This technique makes use of core group of experts to prepare questions regarding desirability of technology development, its feasibility & impact, etc. Experts opinions & responses are collected, summarised & any irrelant material is removed.

Questionare rounds can be repeated as many times as necessary to achieve general sense of consensus.

It provides opportunities for experts for desired changes & revisions between subsequent rounds of questionare. There is no interaction between panel members & as such individual members need not worry about thier opinions owing to reputation or dominance of other members.

(ii) Scenario writting

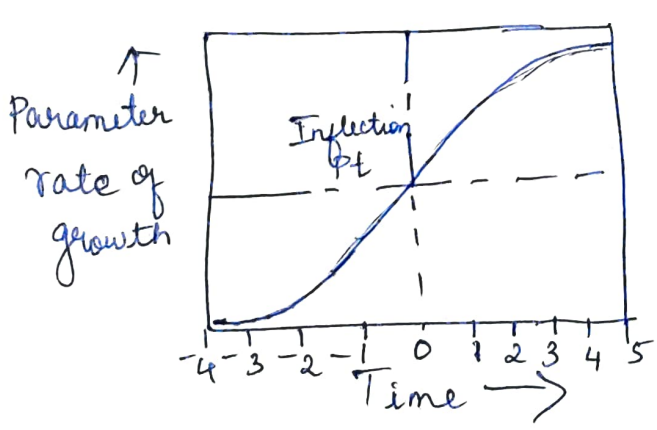
It is prefered for long team future is difficult to predict. Forecaster starts with different sets of assumptions & for each set of assumption a likely scenario of business outcome

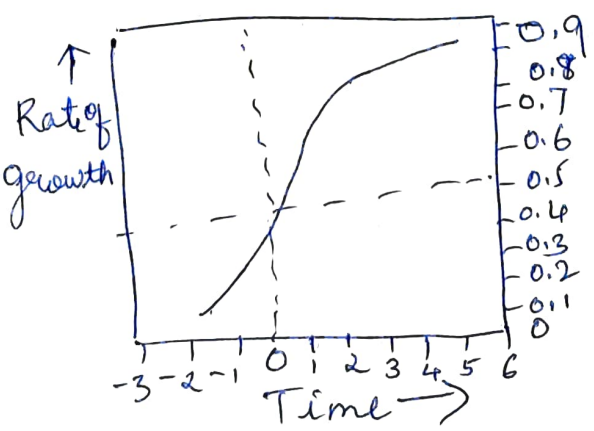
Forecaster thus generates several different future scenarios corresponding to different sets of assumptions allowing decision maker to decide which scenario is most likely to prevail.
There are 3 scenario i.e best, middle one & Worst Case ~~&~~ scenario.

(iii) Growth Curve → It can be used for forecasting how and when a given technical approach will reach its upper limit. Growth phenomena can be described by "S" shaped curve with initially slow growth speeding up before slowing down to approach a limit.

Process involves fitting a growth curve to a set of data on technological performance, then extrapolating growth curve beyond range of data to obtain an estimate of future performance.

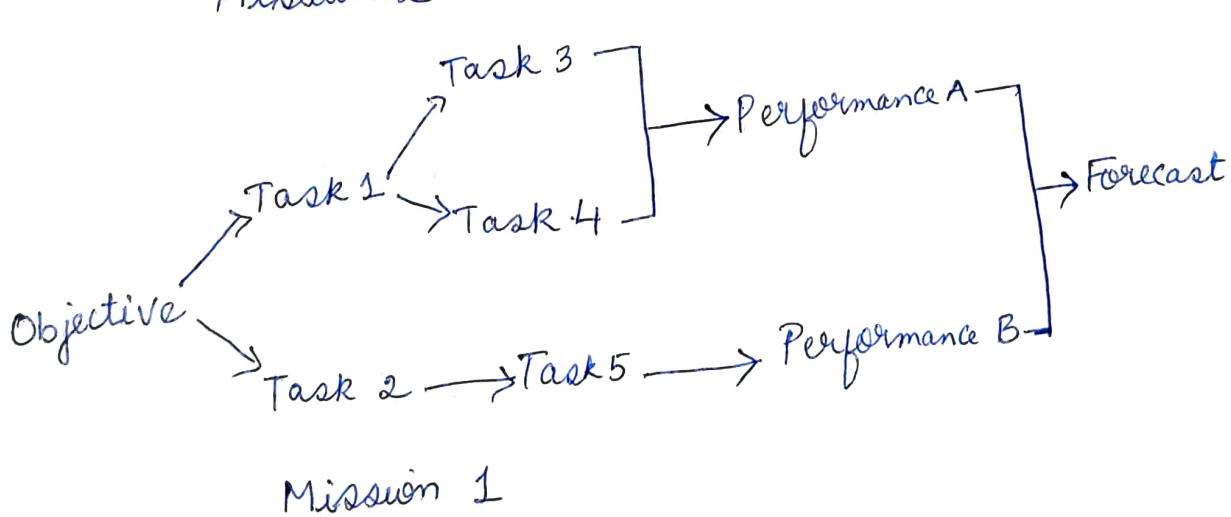
There are 2 types in it
Pearl Curve
Gompertz curve.





Ö a Discuss mission flow diagram in technology forecasting.

It is a specific type of activity diagram that Communicates a sequence of actions or movements for accomplishing specific objective. It was originally Concieved for analyzing military missions & hence name mission flow diagram. Technique involves mapping all alternative routes or sequence by which given task can be accomplished. Analyst needs to identify significant steps on each route & also determine challanges or costs associated with each route. Performance requirements can be derived for each asociated technology.



8.b Briefly discuss tools & methodologies in product innovation process.

Ans * Deep dive → It is brainstorming technique wherein group of people meet to generate new ideas & solutions around specific domain of interest. Intially collect innumerable ideas & evaluate them. It provides quick means for tapping creativity of people by providing free & open environment.

* Prototyping

It is an early sample, model or release of pdt built to test a concept or process or to act as thing to be replicated. It is normally considered as demo like future pdt. It is critical aspect as it helps to understand, define & refine the features & specifications of future pdt.

* Design thinking

It draws on logic, imagination & intuition to explore possibilities of what could be & to Create desired outcomes that benefit end user. It informs human centered innovation, which begins with developing an understanding of customers. Trend tends to minimize uncertainity & risk of Innovation by using collective intelligence through series of lenses.

Theory of Inventive problem Solving

It is technique for innovation that provides excellent principles & concrete tools for creative thinking for technology development. It is similar to brainstorming. It provides novel solutions & problem solving effort to toughest problem.

Open Innovation

It involves flow of ideas within & outside the organization during innovation process. Ideas are evaluated & only the best & most promising ones are selected for development. It lets external knowledge to flow inside the organization which leads to innovative product development.

Co-Creation

It is creative technique that makes use of people external to the company in the ideation phase of new pdt or service development, it includes Customers, suppliers & distributors.

Module - 5

9. a Write short notes on

(i) 3D CAD system → It stands for Three dimensional Computer Aided Design, it Covers Wide variety of design tools used by several industry professionals. It creates 3-D geometry of a p.dt with in virtual environment. It is used to convert concepts into geometrical design which can be used to visualize & simulate the designs. They are normally saved in IGES STEP, etc formats. Not only part design but also assembly design can be created to visualize how they fit together. It forms core element of digital pdt development. It provides increased design quality & accuracy. Rapid generation of BOM's & data outsourced to production pt planning It helps in taking critical decision about pdt development.

(ii) Digital Mock up

It is completely a virtual environment for whole process of 3D development & maintainance of pdt, including configuration & change management.

.. It is used for packaging studies, clash detection, mounting & assembly simulations. This are often linked with simulation procedures such as kinematical simulation process for optimization of movable functionalities.

3D CAD Data from master model form basis for DMU Process.

Environment Created by DMU allows engineers the design & Configure complex pdts & validate their design without a need to build physical prototype.

9(b) Discuss the need & benefit of Virtual pdt development.

Ans

* Helps in evaluating alternate design concepts, perform multiple pdt test & prepare manufacturing tools & process, without a need to build physical prototypes
* Allows many tasks to be performed earlier in pdt development cycle
* gives an insight needed to develop & optimize pdts based customer needs
* Helps to address safety issues before manufacturing
* Exact prediction of pdt performance in virtual space hence minimizing time to mkt, design failures.

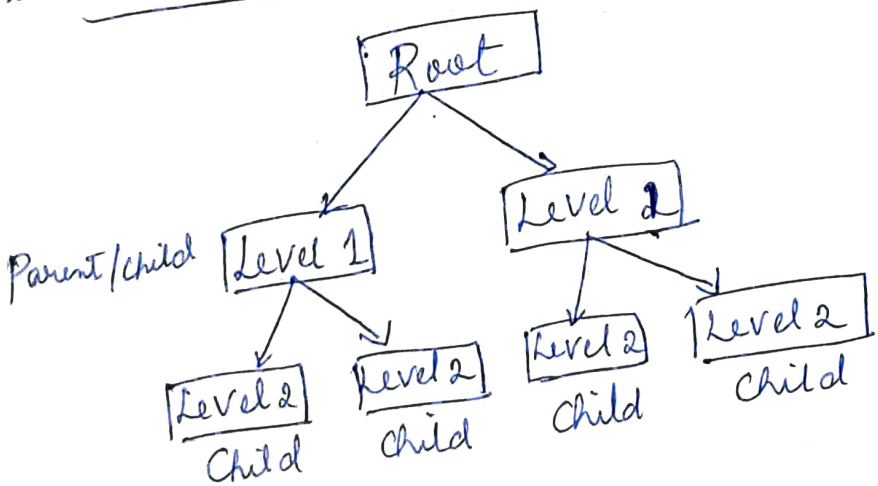
* Saves time & cost involved in pdt development
* Enhances speed of product development
* Enhances collabarative capability through virtual teams - a group of people & sub teams who interact through interdependent tasks.

10(a) What is data model ? Explain different types of data models.

Ans :- It is a database model which supports PDM functions of PLM by providing a structure for pdt data creation, identification, storage & exchange during complete pdt lifecycle.

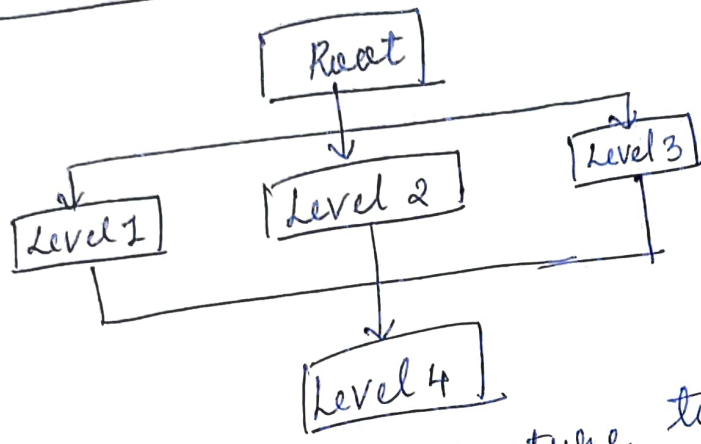
Types

* Hierarchical database model



Here data is organized into a tree like structure where each record has single parent. Data is stored in form of Parent/Child relation node such that each child has one parent.

* Network database model



It uses a network structure to creat relationships between entities. Data is organized in many to many relationship between linked records.

* Relational database model

Here data is stored in tabular form of columns & rows. Each column in table represent an attribute & each row in table represent an record. Each field in table represents a data value. Data maintains a relational relationship in nature.

* Object oriented Model

The model is developed owing to drawback of Relational database model not supporting easily the distribution of one database across no of servers. Here users can define their data

accessing methods. It makes use of small reuseable components called objects. objects & elements (i) Piece of data (ii) Instruction

* Object-relational model

It is a hybrid database model combining simplicity of relational model with advanced features of object oriented database model. It allows designers to incorporate objects into familiar table structure

10(b) Explain guidlines to be followed to write product data description.

Ans :-

* Define target Audience

Not every target group can be triggered with same style & same content. Some key questions to be addressed are

(i) Who are the buyers
(ii) How to improve existing pdt
(iii) Who exactly are target-audience

* Optimize product description

As customers need the details in short & sweet manner hence product description needs to be provided specifically in optimized manner

"So that Customers can grasp necessary information & make instant decision.

* Focus on products attributes & benefits

With min data description needs to inform reader the basic functions, characteristics & benfits of plt. It should highlight competitive & unique features that improves usage value.

* use simple & effective language for communication

Description needs to be simple & easy to understand. It should consist certain words & phrases that naturally evoke an emotional response in humans

* Be fair & transparent

Projecting the product in such a way that people trust it & buy. Building trust is the prime thing that comes out from building better & quality products & marketing it in a proper way.

Prepared by Prof. S.V. Dambal.

HOD, Mech. Engg.

Dean, Academics.