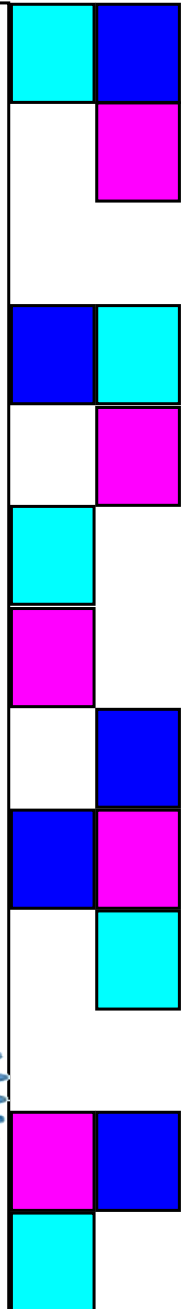
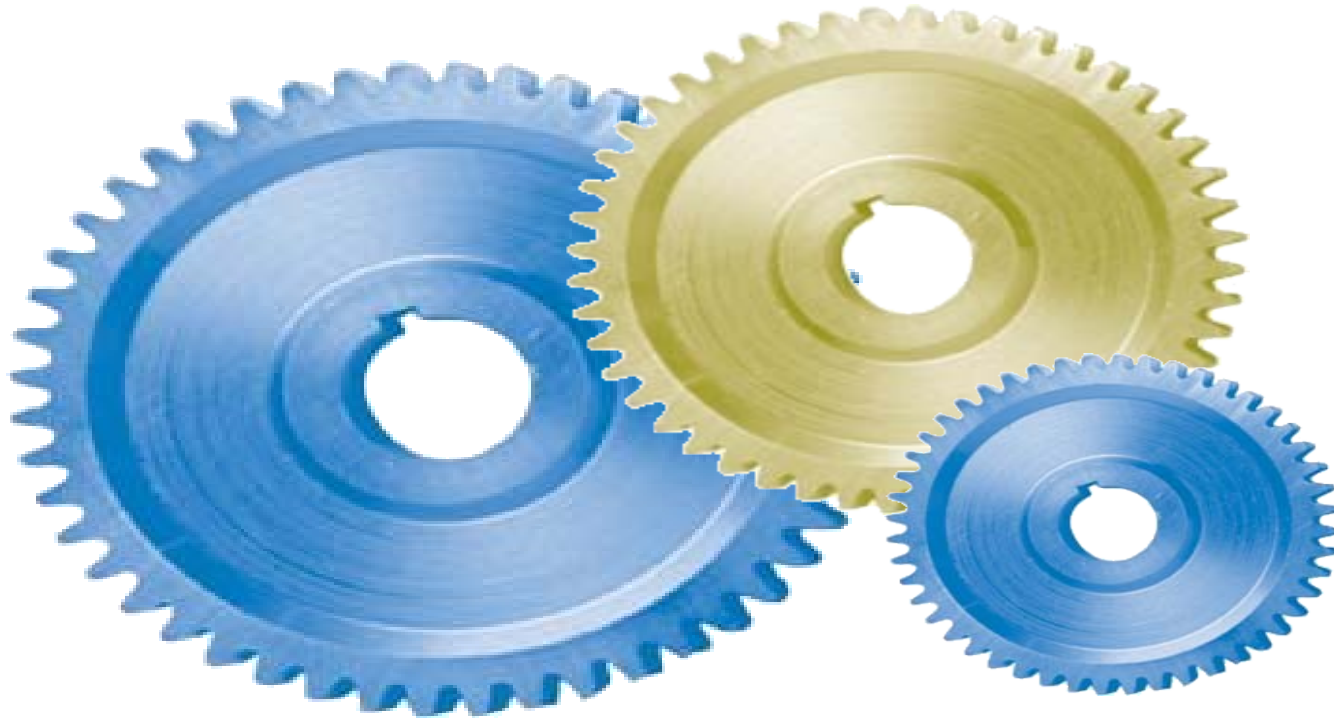
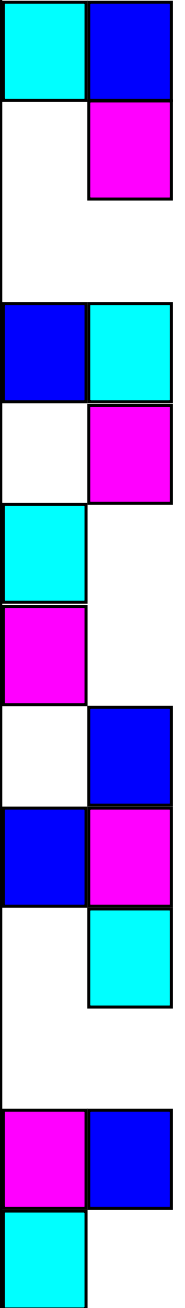


PRODUCT DESIGN AND DEVELOPMENT

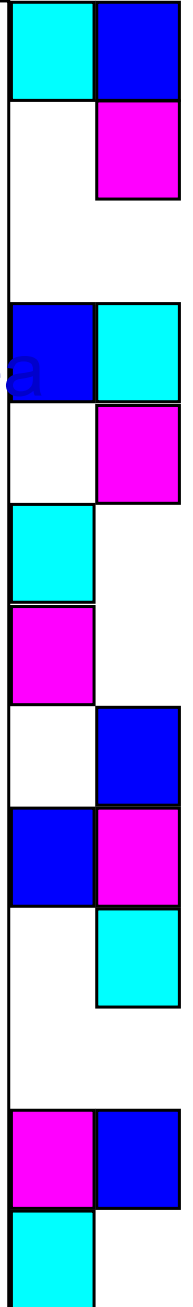
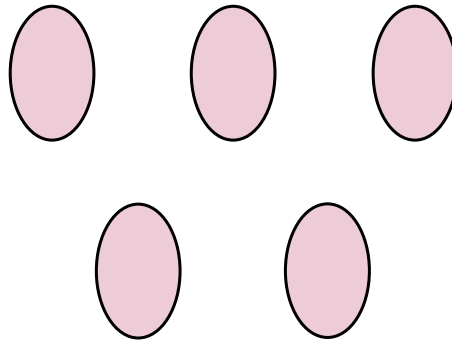


PRODUCT DESIGN



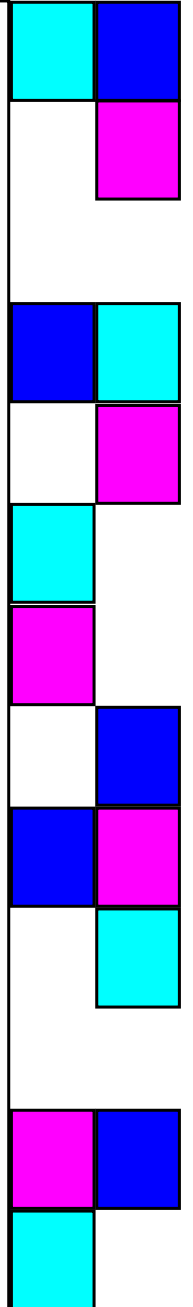
Product Design

Product design can be defined as the idea generation, **concept** development, **testing** and **manufacturing** or implementation of a physical object or service.



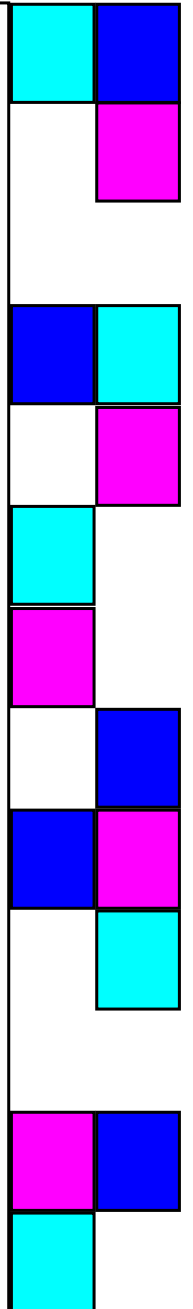
Reasons for Product Design

- ◆ Be competitive
- ◆ Increase business growth & profits
- ◆ Avoid downsizing with development of new products
- ◆ Improve product quality, reduce labor and material cost (if it's a re-design)
- ◆ To open a new business



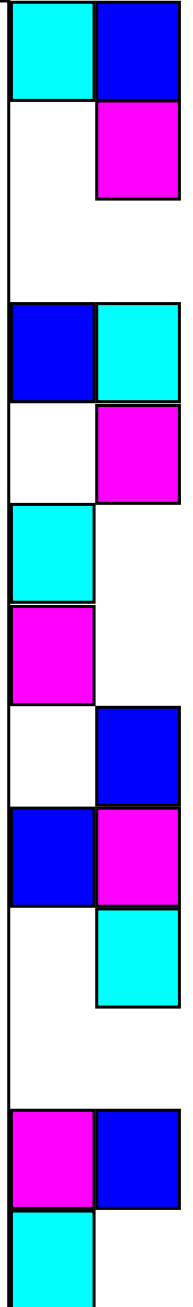
Concepts in Product Design

- Research and Development
- Reverse Engineering
- Manufacturability
- Standardization
- Modular Design
- Robust Design
- Computer-Aided Design
- Concurrent Engineering



Research & Development (R&D)

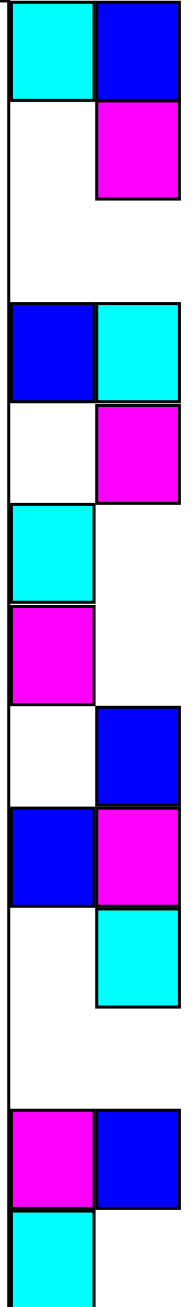
- Organized efforts to increase scientific knowledge or product innovation & may involve:
 - *Basic Research* advances knowledge about a subject without near-term expectations of commercial applications.
Eg: Newton's Law of gravity was a fundamental research but it did not have immediate application
 - *Applied Research* achieves commercial applications.
 - *Development* converts results of applied research into commercial applications.



Reverse Engineering

Reverse engineering is the dismantling and inspecting of a competitor's product to discover product improvements.

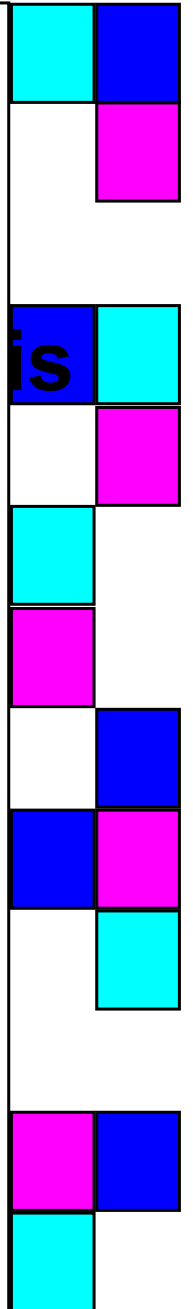
Eg: Many companies have to follow the reverse engineering approach in order to break Sony's monopoly for new products in shortest possible time.



Manufacturability

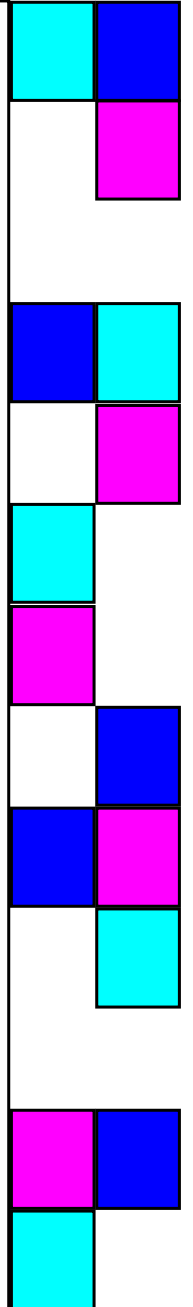
■ **Manufacturability is the ease of fabrication and/or assembly which is important for:**

- Cost
- Productivity
- Quality



Standardization

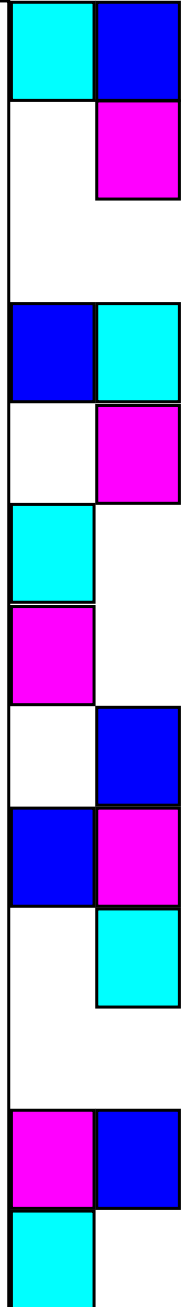
- Standardization
 - Extent to which there is an absence of variety in a product, service or process
- Standardized products are immediately available to customers



Modular Design

Modular design is a form of standardization in which component parts are subdivided into modules that are easily replaced or interchanged. It allows:

- easier diagnosis and remedy of failures
- easier repair and replacement
- simplification of manufacturing and assembly

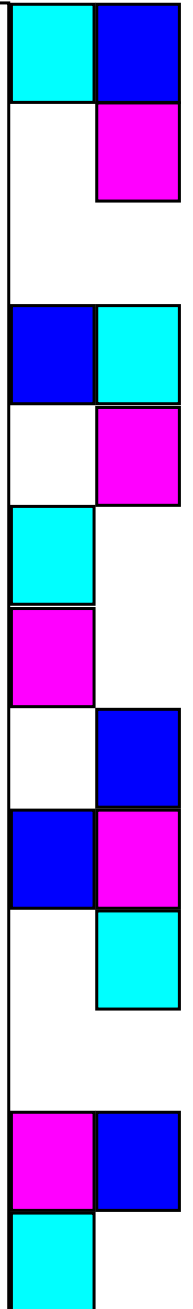


Robust Design

Robust Design: Design that results in products or services that can function over a broad range of environmental conditions

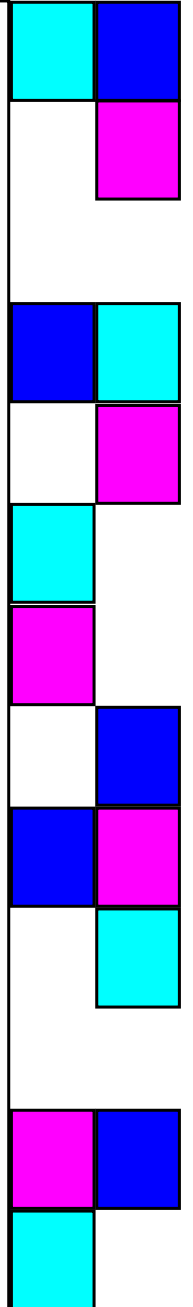
Eg: A jeep is more robust in design than a small car as it can be effectively used in hilly areas with poor roads.

Product is designed so that variations in production or assembly do not adversely affect the product.



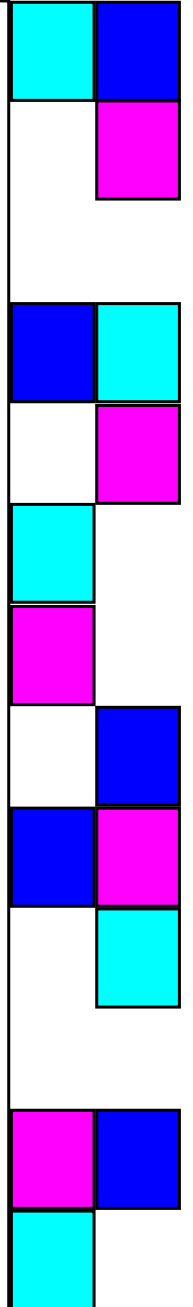
Concurrent

- Design approach that uses multifunctional teams to simultaneously design the product & process
- Replaces a traditional ‘over-the-wall’ approach where one group does their part & then hands off the design to the next group



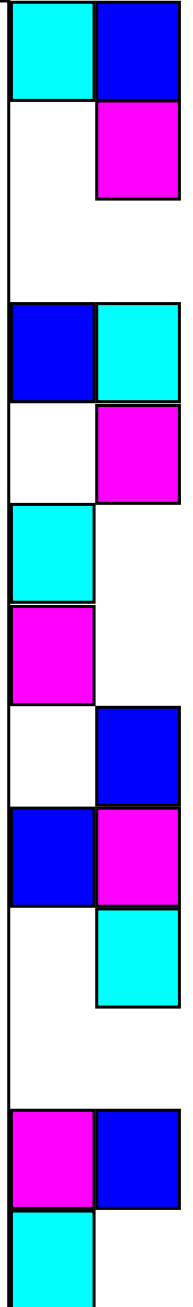
Computer-Aided Design

- *Computer-Aided Design (CAD)* is product design using computer graphics.
 - increases productivity of designers, 3 to 10 times
 - creates a database for manufacturing information on product specifications
 - provides possibility of engineering and cost analysis on proposed designs

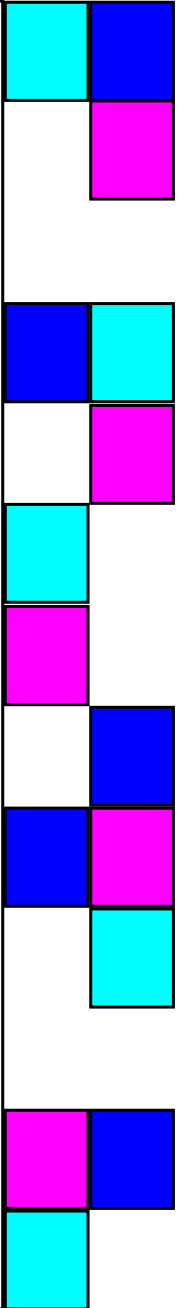


Desirable Features in Product Design

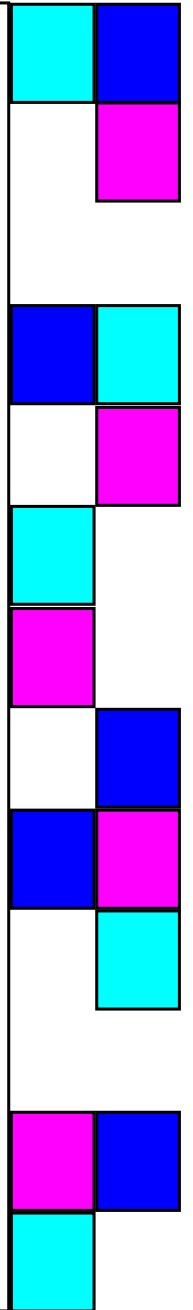
- ❖ Minimize number of parts
- ❖ Use common components and processes
- ❖ Standardize components and tools
- ❖ Simplify assembly through – ease to use fasteners, orientation & accessibility and fool-proof operations and assembly
- ❖ Use modularity to obtain variety
- ❖ Make product specifications and tolerances reasonable
- ❖ Design products to be robust



Design Change to Reduce the Number of Parts in a Bracket

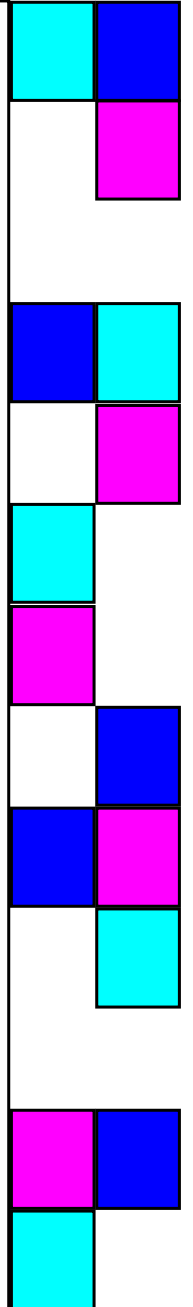


PRODUCT DEVELOPMENT

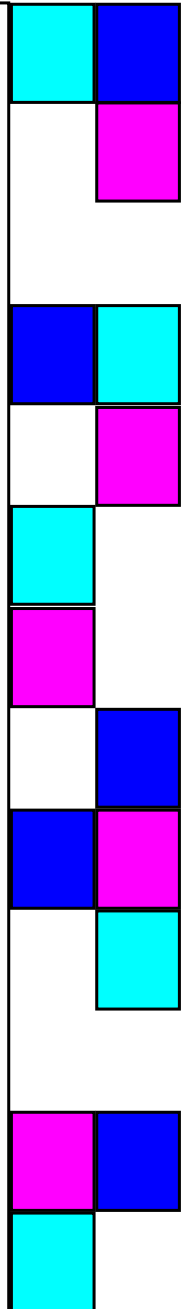


Product development

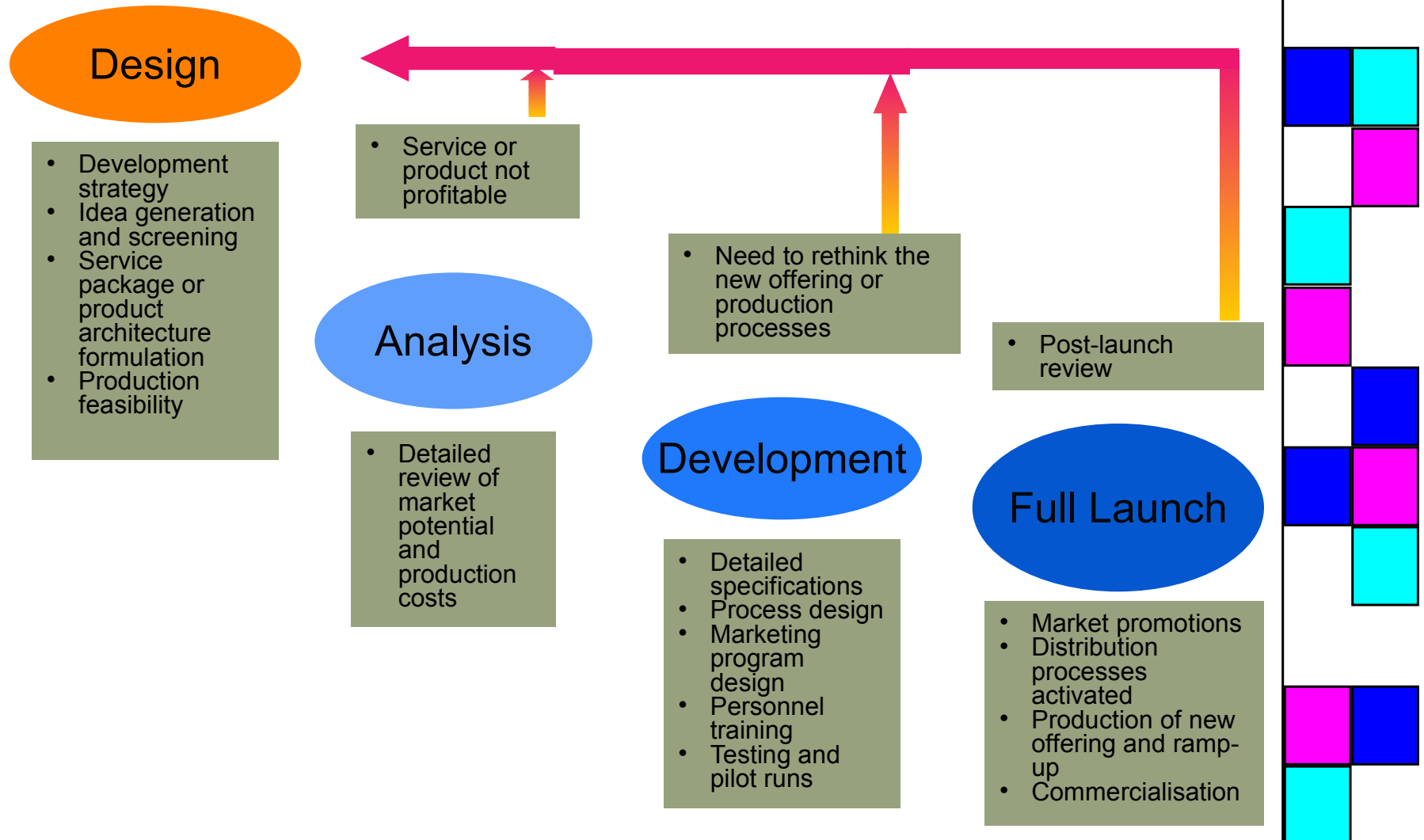
- **A Product Development Process** is the entire set of activities required to bring a new product concept to a state of market readiness.
- PD is the organization and management of people and the information they develop in the evolution of a product.



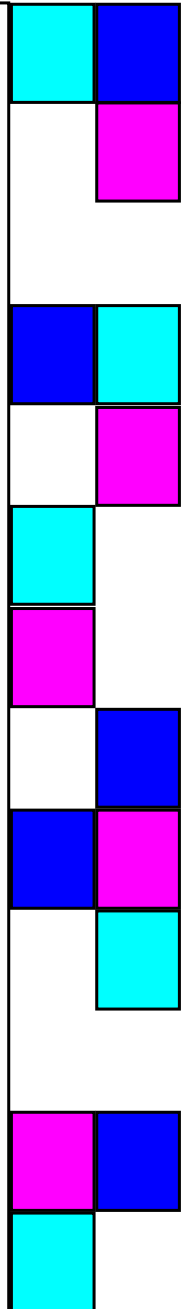
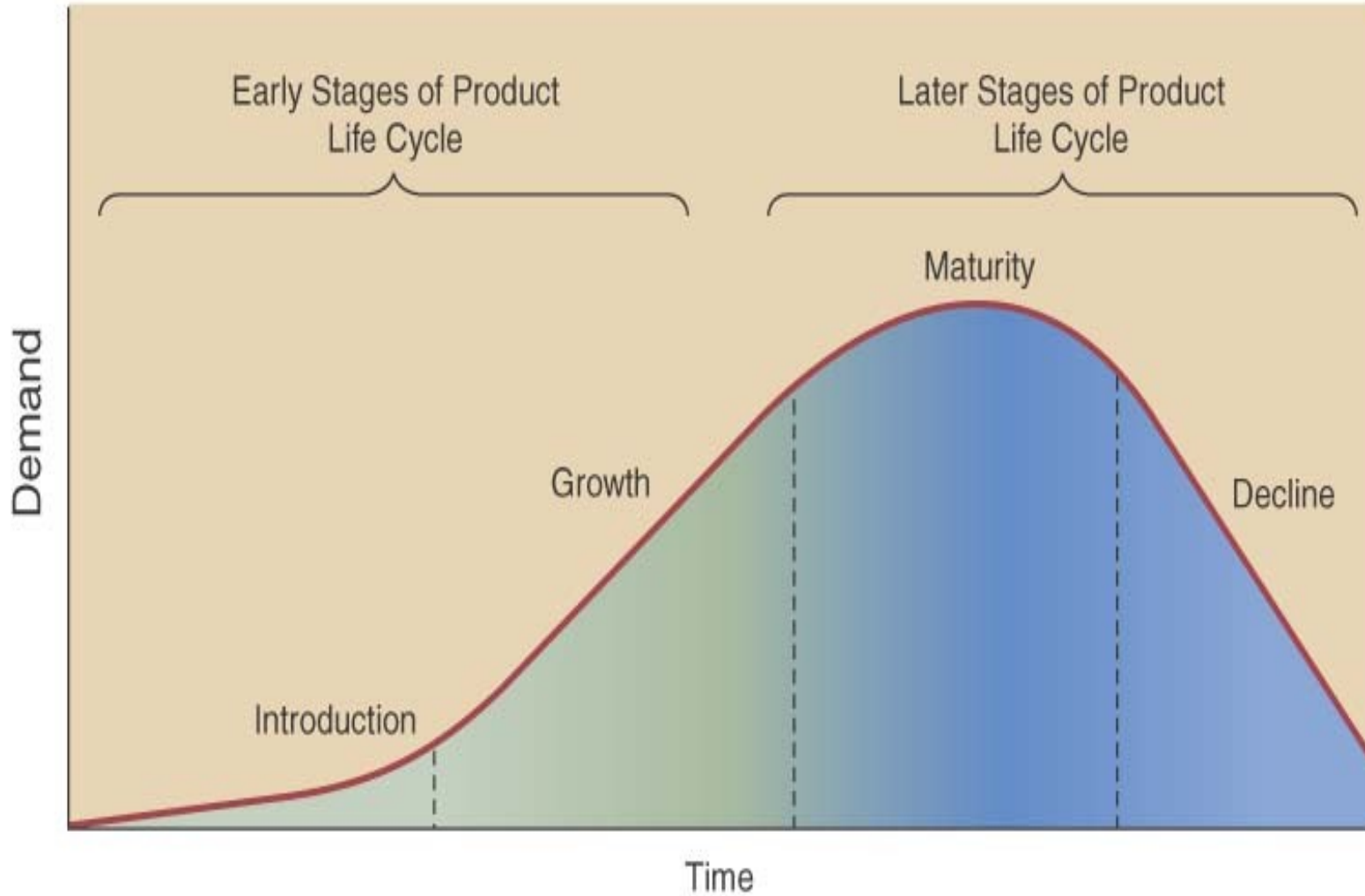
- ◆ To satisfy consumers (Demand)
- ◆ To create new jobs (Irish Economy)
- ◆ To maintain margins (Market share)
- ◆ To expand the business (Growth)



New Product Development Process



PRODUCT LIFE CYCLE

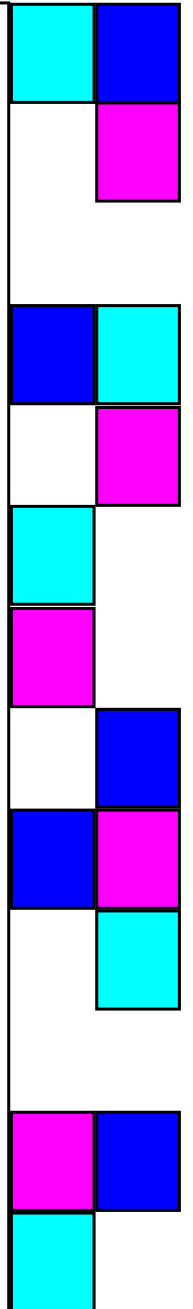


Product Life-Cycle Stages

PLC Stages

- *Product development*
- *Introduction*
- *Growth*
- *Maturity*
- *Decline*

- Begins when the company develops a new-product idea
- Sales are zero
- Investment costs are high
- Profits are negative

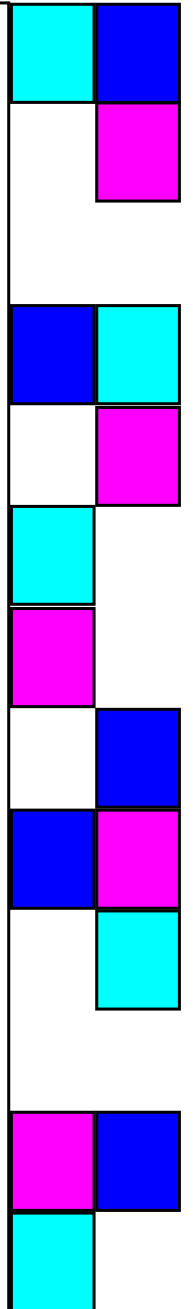


Product Life-Cycle Stages

PLC Stages

- *Product development*
- *Introduction*
- *Growth*
- *Maturity*
- *Decline*

- Low sales
- Creates awareness in the market
- High cost per customer acquired
- Negative profits
- Innovators are targeted
- Little competition

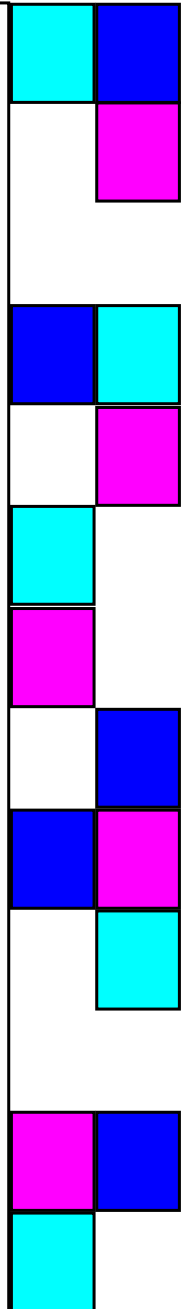


Product Life-Cycle Stages

PLC Stages

- *Product development*
- *Introduction*
- **Growth**
- *Maturity*
- *Decline*

- Rapidly rising sales
- Average cost per customer
- Rising profits
- Early adopters are targeted
- Growing competition

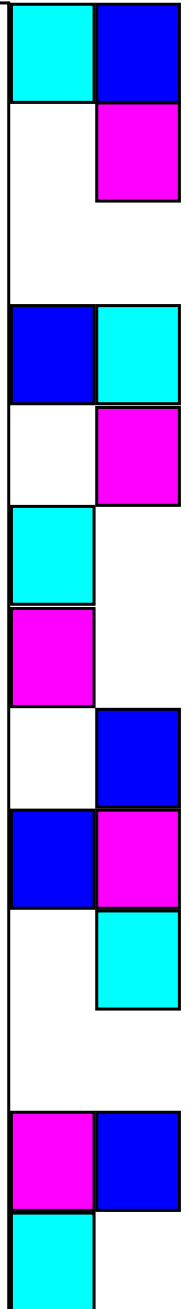


Product Life-Cycle Stages

PLC Stages

- *Product development*
- *Introduction*
- *Growth*
- *Maturity*
- *Decline*

- Sales peak
- Low cost per customer
- High profits
- Middle majority are targeted
- Competition begins to decline

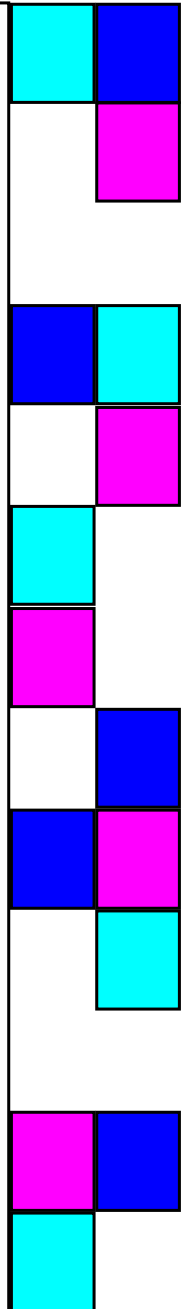


Product Life-Cycle Stages

PLC Stages

- *Product development*
- *Introduction*
- *Growth*
- *Maturity*
- *Saturation*
- *Decline*

- Costs become counter-optimal
- Sales volume decline or stabilize
- Prices, profitability diminish
- Profit becomes more a challenge of production/distribution efficiency than increased sales

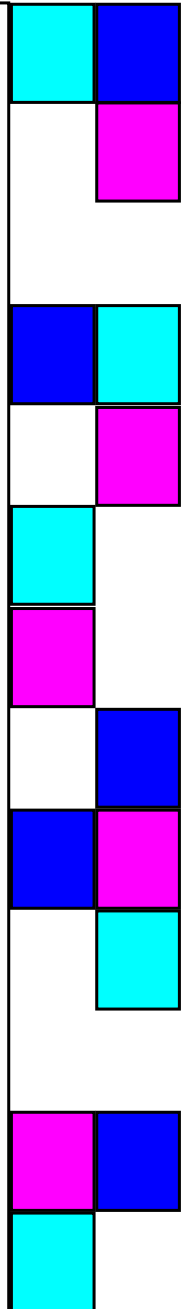


Product Life-Cycle Stages

PLC Stages

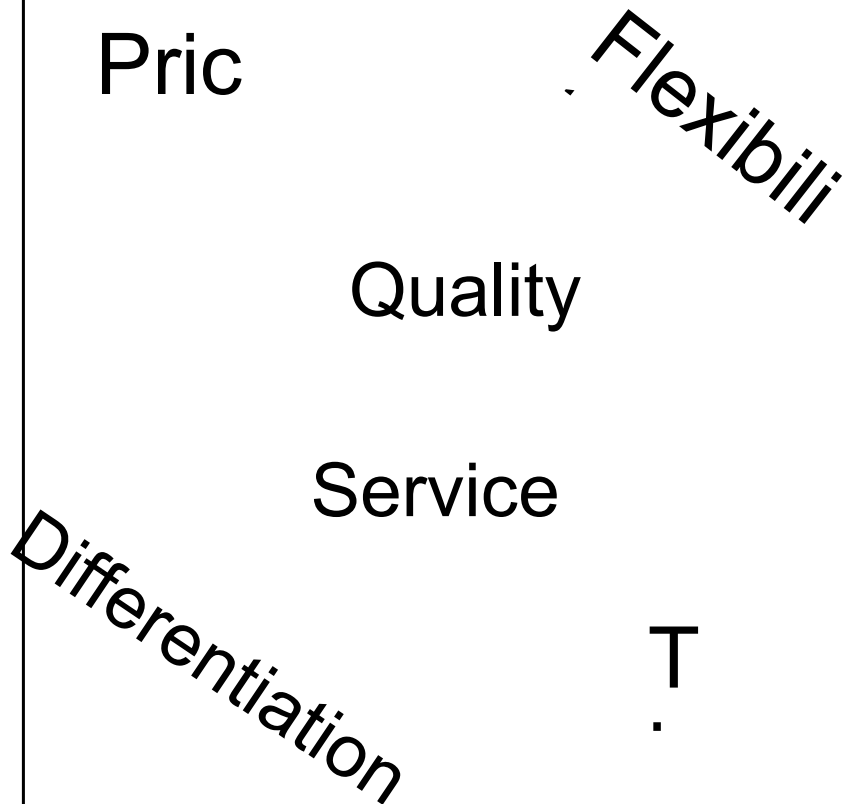
- *Product development*
- *Introduction*
- *Growth*
- *Maturity*
- *Decline*

- Declining sales
- Low cost per customer
- Declining profits
- Laggards are targeted
- Declining competition
- Product to be re-modified, or replaced within the market



Competitive Priorities

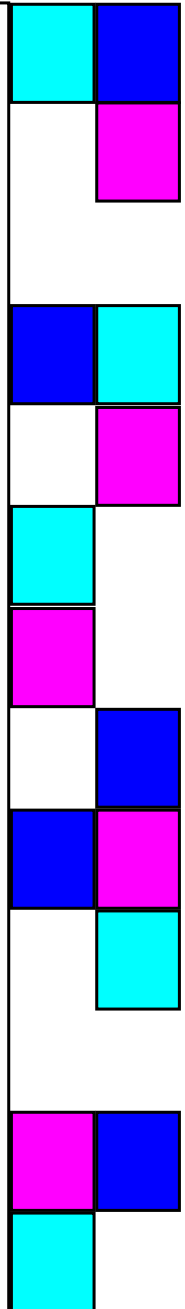
Business organizations compete with one another in a variety of ways. These includes



1. Low-cost operations
2. Top quality
3. Consistent quality
4. Delivery speed
5. On-time delivery
6. Development speed
7. Customization
8. Variety

ORDER WINNERS AND ORDER QUALIFIERS

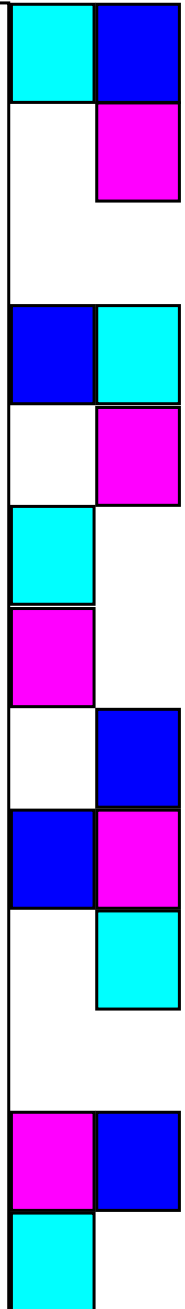
- To develop effective strategies for business, it is essential for organizations **to determine what combinations of factors are important** to customers, **which factors are order qualifiers, and which are order winners.**
 - **Characteristics** such as price, quality, delivery reliability, delivery speed can be order qualifier or order winner.
 - **Characteristics** which may be an order qualifier in some situations will become an order winner in another situation [example Quality]
- It is also necessary **to decide on the relative importance of each factors** so that an appropriate actions can be given to the various factors.



ORDER WINNERS AND ORDER QUALIFIERS

Within a given industry or market, certain competitive priorities can be identified as being either **order winners** or **order qualifiers**.

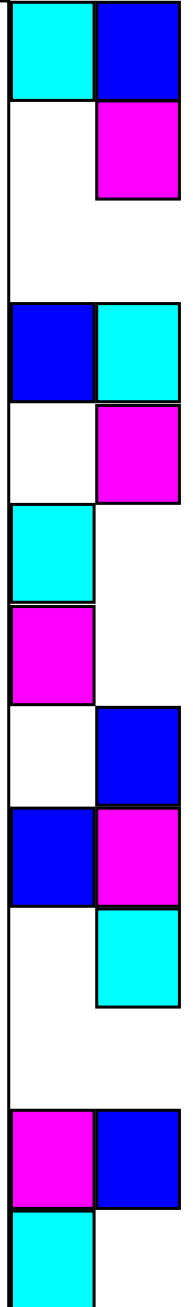
- **Order Qualifiers** –they are the basic criteria that permit the firms products to be considered as candidates for purchase by customers.
 - A brand name car can be an “**order qualifier**”
- **Order winners** –they are the criteria that differentiates the products and services of one firm from another.
 - Repair services can be “**order winners**” Examples: Warranty, Roadside Assistance, Leases, etc.



Value Engineering

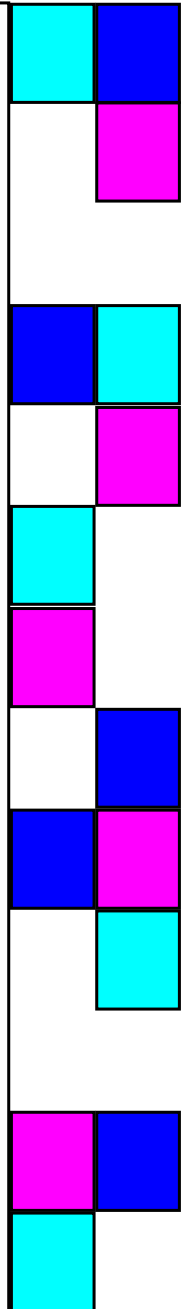
Value engineering is a systematic application of recognized techniques which identifies the function of product, assigns monetary values to them and tries to fulfill the functions at reduced costs without compromising on performance.

Its Objective is to achieve equivalent / better performance at lowest total cost, maintaining all functional requirements



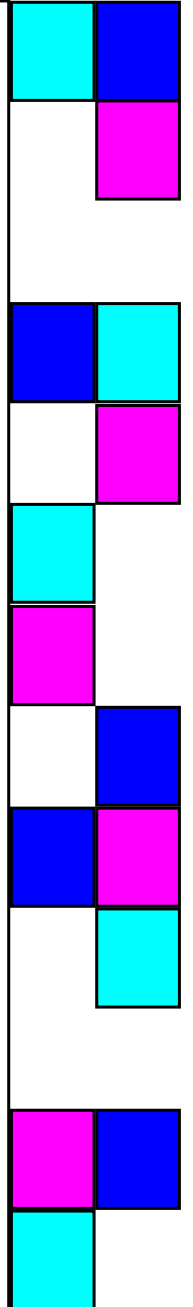
Steps and Phases in Value Engineering

- **General phase:** team work ,goods, raw materials... by judgement etc...
- **Information phase:** customer need, customer demand, alternatives, cost of competitive product, material available, technology, condition of product to be performed.
- **Function phase:** identifies the function of the product, assigns monetary value, identifies the poor value, creativity of product
- **Evaluation phase:** product is evaluates on the basis of funtionality, reliability, athestic, cost.
- **Investigation:** we convert workable and sellable product into practical aspects.
- **Recommendation:** we recommend to discontinue those products which do not add value.



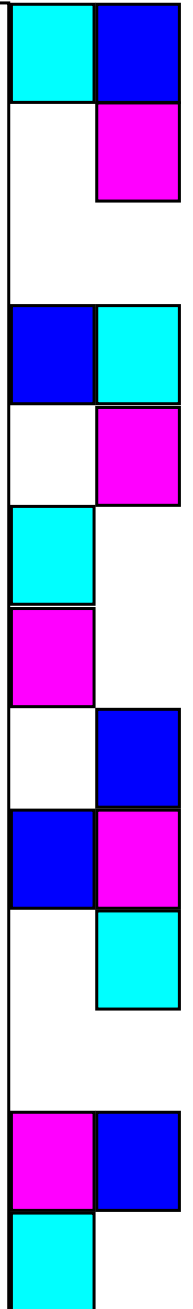
CONCLUSION

Hence, the economic success of manufacturing firms depends on their ability to identify the needs of the customers and to quickly create products that meet these needs and can be produced at low costs.



Reference:

- Product design and development –
Karl T. Ulrich and Steven D. Eppinger
- Production and Operations
Management- RC Manocha
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THANK YOU

