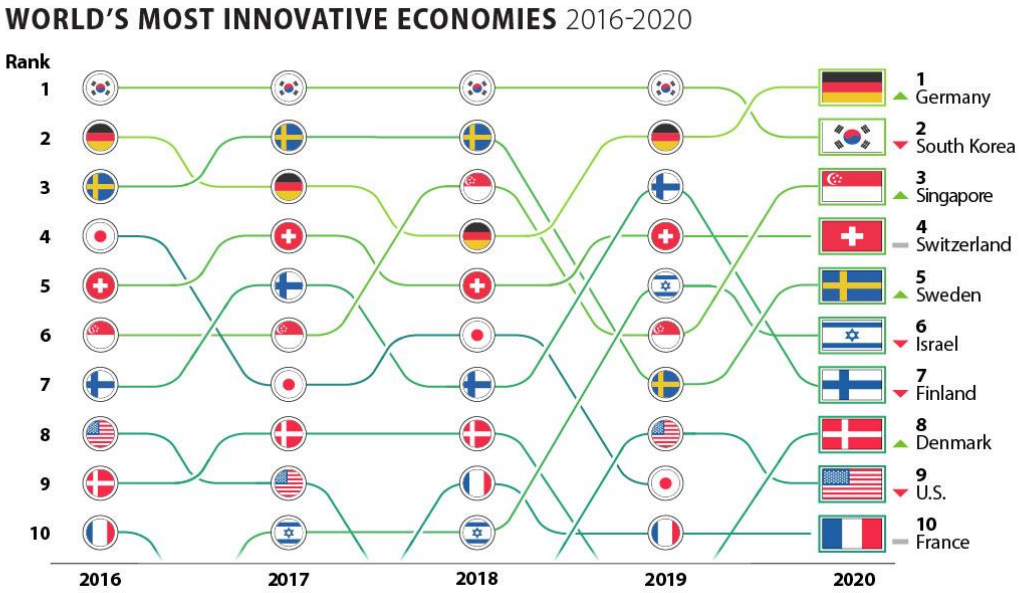
Unit- IV

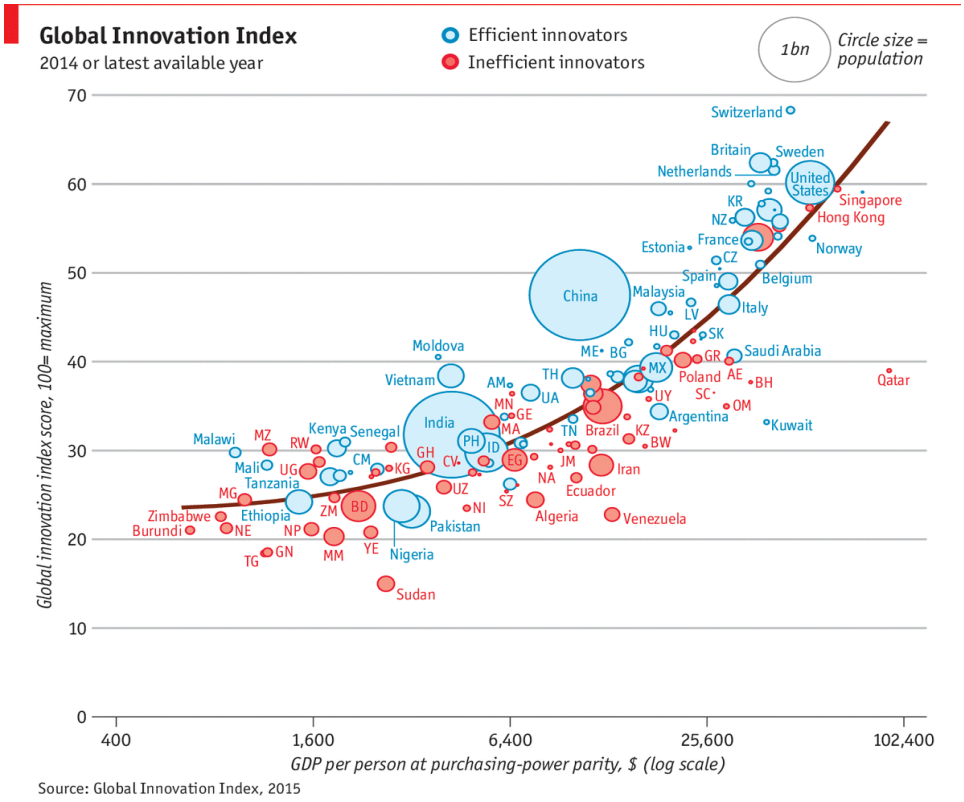
PRODUCT INNOVATION

4.0 Introduction

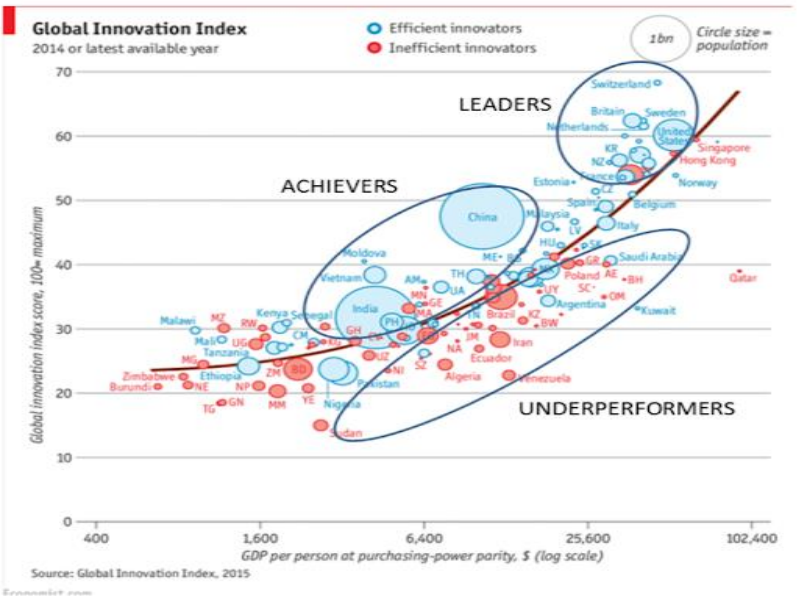
- Innovation is currently promoted by many governments and technical people as something that is an essential ingredient in a 21st century world economy
- Most economists agree that technological innovation is a key driver of economic growth and human well-being



- Innovation was again a front-of-mind theme in Davos at the World Economic Forum's annual assembly of political and business leaders in 2020
- The global conversation centered around the ability of countries to innovate in the face of changing times. An economy's response to megatrends, such as tech breakthroughs and the risks of climate change, can dictate its long-term success
- For the first time in years, **Germany** clinched the top spot for the most innovative economy, ending South Korea's winning streak.
- Science is also innovative as it too is exploring new unchartered areas at the current boundary of knowledge
- **Innovative Technology** is where innovative ideas can be applied to "something useful" where, the innovation is not only new, but useful too
- Creating an innovative technological culture is difficult and requires very creative people working alongside many other able groups such as Engineers, financiers and managers.



- The ability to innovate is a key success factor in the 21st century economy
- Countries compete as integrated systems in the global world.
- There is a clear relationship between a country's innovation index and its per capita income
- The graph shows this relationship, differentiating between those countries that behave as efficient innovative systems or those that do not
- Said efficiency is measured as the relationship between the score of *outputs* and *inputs* in the sub-indices measured



- The blue countries obtain good relative scores in outputs, maintaining certain levels of inputs (and conversely, the countries in red, comparatively, are erring in their policies).

- Often the innovative concept is the easy bit and turning this into a successful technology is by far the most challenging part of the whole process.

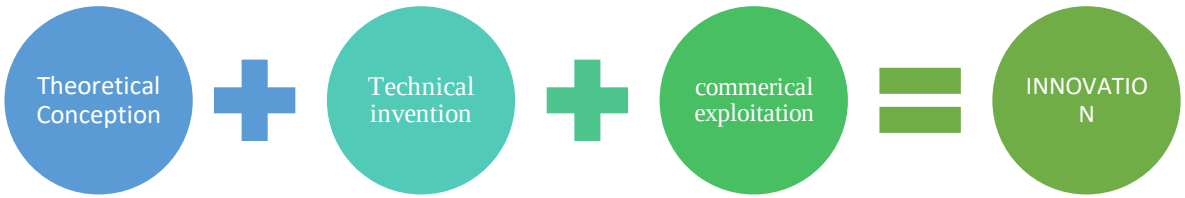
4.1 Definition of Innovation

- Innovation can be defined as the application of new ideas to the products, processes, or other aspects of the activities of a firm that lead to increased "value."
- This "value" is defined in a broad way to include higher value added for the firm and also benefits to consumers or other firms
- Other Definitions by various Authors

Authors	Definitions
Joseph Schumpeter (1930)	• Introducing a new product or modification brought to an existing product • A new process of innovation in an industry • The discovery of new market • Developing new sources of supply with raw material • Other changes in organization
Peter Drunker (1954)	• Innovation is the tool of entrepreneurship • It is the means by which the entrepreneur either creates new wealth producing resources or endows existing resources with enhanced potential for creating wealth
Howard and Sheath (1969)	• Any new element brought to the buyer, whether or not new to organization
Mohr (1969)	• The degree to which specific new change are implemented in an organization
Kenneth Simmonds (1986)	• Innovation are new ideas that consists of new products and services, new use of existing products, new marketing for existing products or new marketing methods

Damanpour (1991)	• Development and adoption of new ideas by a firm
Lumpkin (1996)	• Innovation can be defined as a process that provides added value and a degree of novelty to the organization, suppliers and customers, developing new products, solutions, products and services, and new ways of marketing.
Boer and During (2002)	• Creating a new association(combination) product - marketing-technology-organization

- From the definitions of innovation address two important distinctions:
    1. The innovation process comprises the technologies development of an invention combined with the market introduction of that invention to the end users
    2. The innovation process is iterative in nature and thus, automatically includes the first introduction of a new innovation and the reintroduction of an improved innovation
- It is important to elucidate that an invention does not become an innovation until, it has processes through production and marketing tasks and is diffused to the market place



<u>Evaluation of pencil sharpeners:</u>

- A sharpener seems like a simple tool, but which one can use change the performance of the materials completely
- When acquiring a sharpener, need to consider the diameter of the pencils want to use, the brittleness of their leads, whether want a manual or electrical sharpener and type of blade prefer.

Helical sharpeners:

Simple pencil sharpeners:

Double metal	
Single pencil	
Double plastic	
Single plastic	
Pastel pencil	
Single for round tips;	

Single plastic Jumbo	
Metal pencil	

Reservoir Sharpeners:

Manual Twin sharpener with Reservoir	
Double Sharpener box	

Glass jar: single hole metal pencil sharpener	

Helical Pencil sharpeners:

Plastic Desktop crank pencil	
Super point Manual helical with pinch chuck	
Crank Desk top pencil	

Electric pencil sharpeners:

Automatic Battery pencil sharpener	
Electric pencil sharpener with Auto stop	

4.2 Invention Vs Innovation

- The First person to make a novel and prospectively useful product or process is an inventor
- The first person or enterprise to exploit that invention in a commercially viable product or service is an innovator
- Example: Nike shoes

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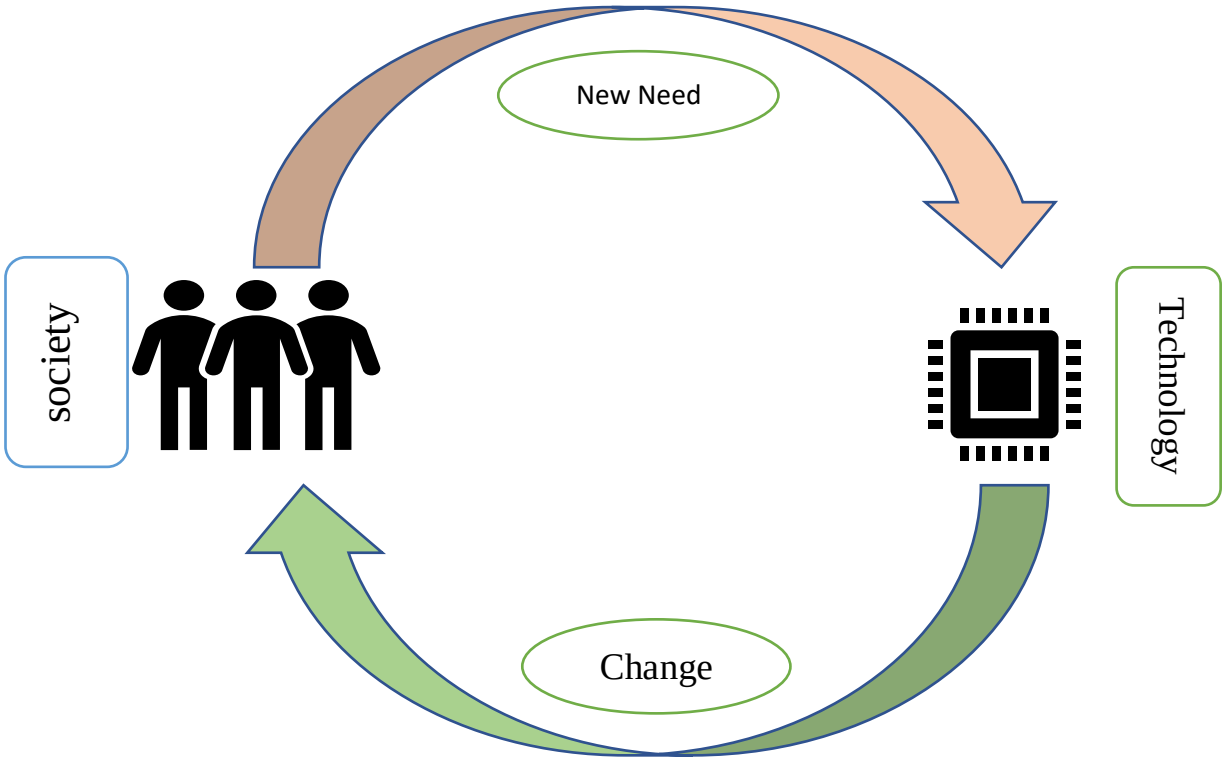
- Bill Bowerman, coach of the university of Oregon (U.S) track team, is known for producing numerous Olympic champions and world record holders.
- Bowerman liked to make running shoes for his athletes as he was dissatisfied with shoe design in the 1960s and early 1970s.
- He founded Blue Ribbon Sports (BRS)with Phil knight and they had Bowerman's designs for running shoes manufacturing by Onitsuka in Japan.
- When frank shorter won the Olympic gold medal for the marathon in Munich in 1972, a running boom was launched in the U.S.
- With the running boom came a huge demand from the mass for comfortable shoes suitable for road running.
- Bowerman's designs were well suited to exploit that demand.
- The pattern of initial limited implementation followed by extensibility is seen again as Bowerman's interests were initially focused on the needs of high-performance athletes.
- The opportunity for mass marketing and expansion into adjacent business was successfully exploited by NIKE
- Here dual aptitudes required in a successful venture
- In this case, Bill Bowerman is the inventor, and Phil knight is an innovator

4.3 why innovation:

- ❖ Improves productivity
- ❖ Improve process and organizational efficiency
- ❖ Increases revenue
- ❖ Increases market share
- ❖ Faster speed to market for products and services

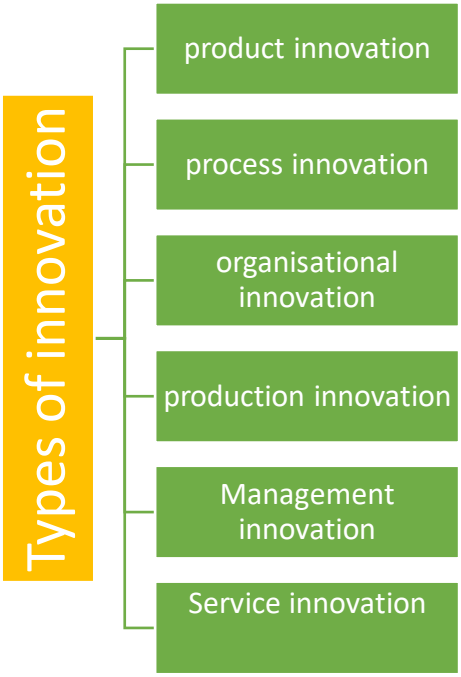
- ❖ Enhances employee engagement and retention
- ❖ Increases customer loyalty
- ❖ Reduce the risk of disruption by competitors

4.4. Nature of innovation



- When a product from technology comes it changes the social behaviour that means the socio-economic structure will change
- From the society again new need will occur
- If the technology reacted to the new need then a new product will come then it impacts the society
- If the technology not reacted to the new product then the old product become obsolete
- The cycle repeats and innovation are associated with it.

4.5 Types of innovation

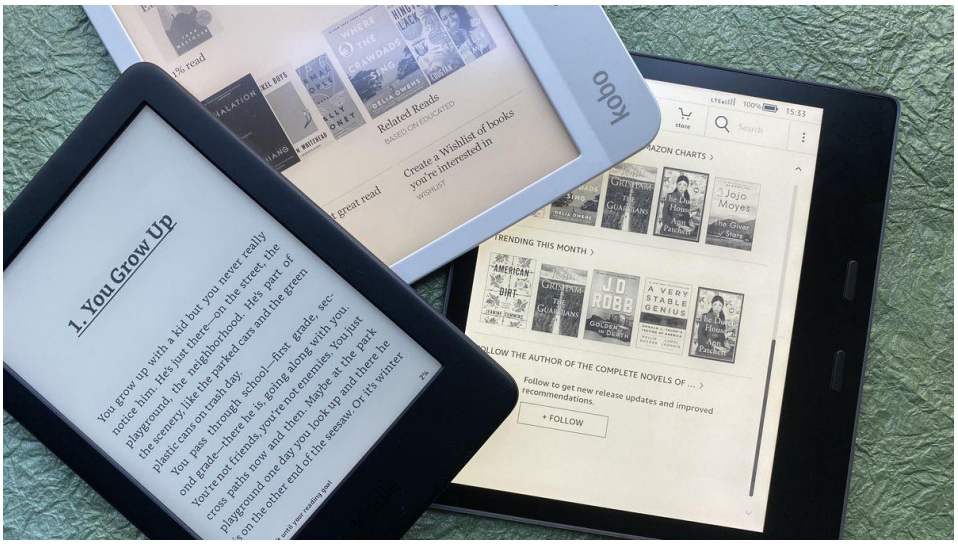


- According to focus of innovation, there are three types of innovation
    1. Product innovation
    2. Process innovation
    3. Organizational innovation
- Product innovation:
    - ❖ it involves new product and new characteristics of old products.
    - ❖ A product innovation is the act of bringing a new to the market place that improves the range and quality of products on offer
    - ❖ The process that makes them may be much the same but the product has changed incrementally or radically
    - ❖ Product innovation may be tangible manufactures goods, intangible services, or a combination of the two.
    - ❖ Tangible product innovation that has had a very significant impact on the way people live and work are personal computers, mobile phones, and microwave ovens.
    - ❖ Product innovation is a type of innovation that is more noticeable for the consumer and it is related either to the enhancement of a company's older products, either to the development of new products which are based on new technologies or which solve new needs of a consumer
    - ❖ Product innovation occurs as a reaction to multiple factors – for example, a consumer needs are determined by social, cultural or economic factors, while at a business and organizational level, product innovation is performed when its purpose is the expansion to new market segments or the attainment of competitive advantage.

❖ Examples of product innovation:

1. **E-reader:**

   E-readers are innovative products that meet an older need in a new manner and a new need, which occurred as a result of the evolution of the social, cultural and economic factors



❖ The older need is that of reading.

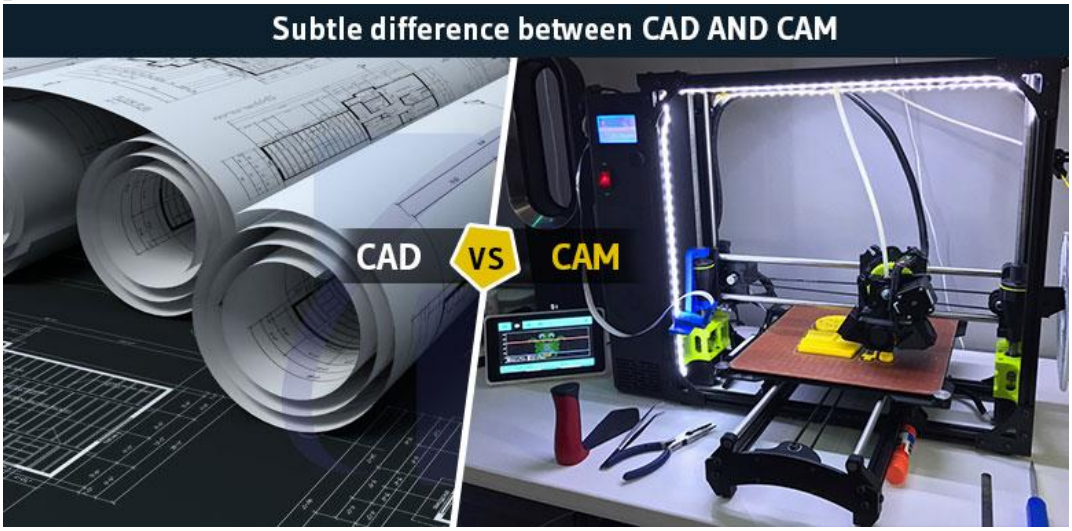
❖ Until the first E-readers emerged on the market, reading was happening in the same way from the beginning-on paper or other physical surfaces.

❖ Well, with the evolution of technology the possibility of creating this type of digital solution to an older problem emerged.

2. **Apple**

❖ Apple is probably one of the companies which have the most well-known product innovations. Starting from the role that the company had in evolution of the first personal computer in 70's, to all the types of smart phones they released in the last 10years.

Process innovation:

- It refers to new way of doing something. The products may be the same but the way of producing is new, better, more efficient or more reliable
- Process innovation focuses on the innovation of facilities, skills and technologies used for the production and delivering of products and services.
- As opposed to product innovation the effect is not as noticeable to the consumers.
- Most of the times, process innovation is performed either within equipment used, either within the technologies used for developing the product or even within the methods used by the employee
- Examples:
  - ❖ Going to visit the doctor and recording that arrived for appointments by touching a screen instead of talking to a receptionist
  - ❖ Computer-aided designs and computer aided manufacturing are process innovations.
  - ❖ 

  - ❖ Google:
  - ❖ Process innovation does not need to be present only the production's process case. It can be carried out in any type of the process involved in a company, including processes that are related to the employees and human resources.

- process innovation in HR from google

> *We encourage our employees, in addition to their regular projects, to spend 20% of their time working on what they think will most benefit Google. This empowers them to be more creative and innovative. Many of our significant advances have happened in this manner.*

- Multiple Google products have indeed occurred as a consequence of this 20% time off.
- Among those Gmail, Google maps, Google talk, Google classes, Google AdSense the last one being responsible for almost 25% of the Google's annual income.

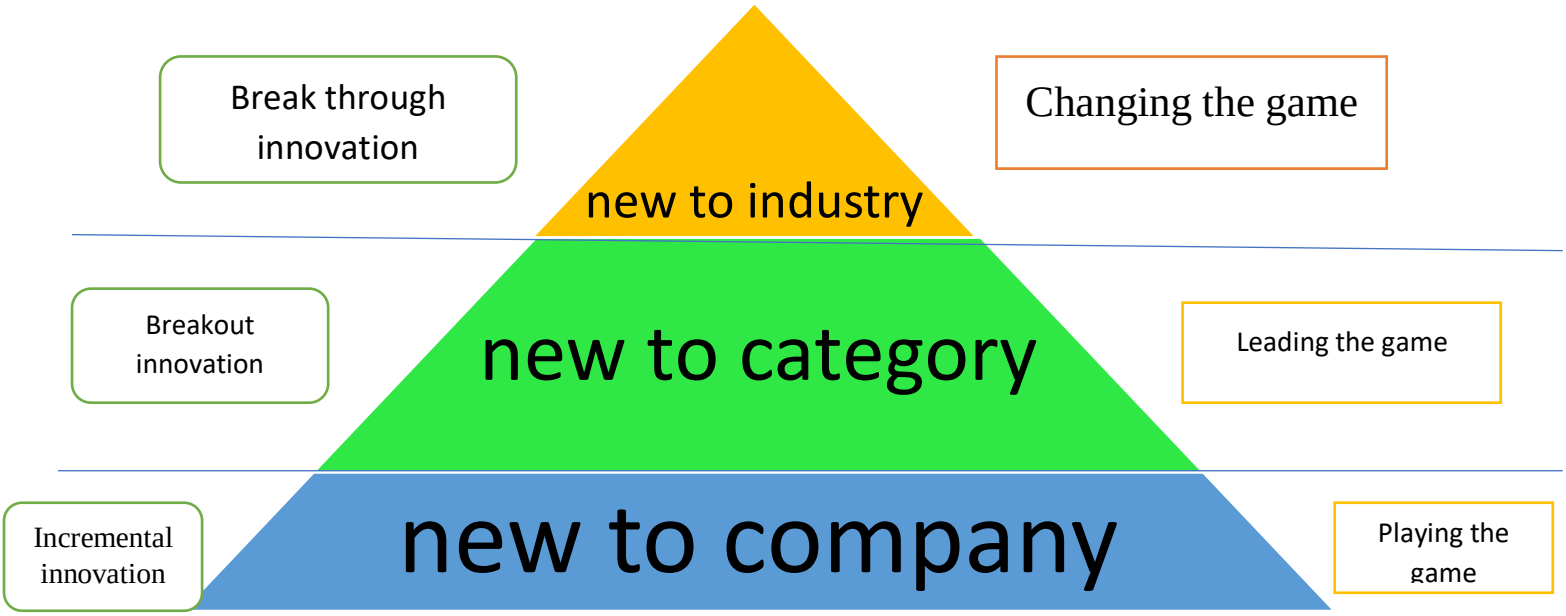
- <u>The relation ship between product and process innovation</u>:
- The main difference between product innovation and process innovation is the fact that product innovation is truly noticeable to the consumers.
- Process innovation facilitates product innovation.
- These types of innovation can go hand in hand with each other or they can be extremely different.
- They are indeed two of the multiple types of innovation, but they are two of the most used ones as they work with tangible resources.

Organizational innovation:

- It finds new ways of structuring and managing people.
- The product and process may be same but the way of organizing the people has changed
- In traditionally organized companies, ideation, idea generation and business innovation often fail due to structural problems.
- These challenges can be mastered through organizational innovation
- Although companies invest time and money to establish an idea management and innovation management system, define innovation processes and measure innovation, structural barriers prevent success.
- Structural problems are:
    - ❖ Political problems and conflicts within the company
    - ❖ Destructive criticism, destructive competition and destructive pressure
    - ❖ Strict control by management
    - ❖ An excess of formal structure and procedures
    - ❖ Precisely defined processes that prescribe what is to be improved by whom and with what methods.

- Organization innovation provide the solution for structural problems.
- With the help organizational innovation procedures, HR department, Maintenance department and other department working together for a common output.

4.6 levels of innovation:



Incremental innovation:

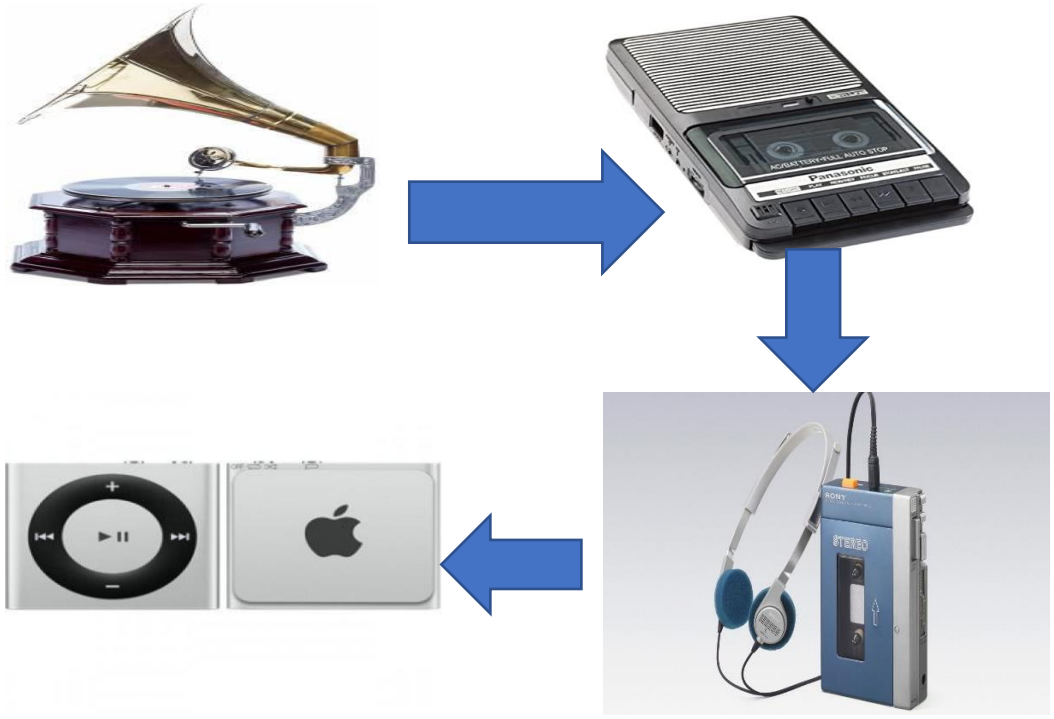
- Typically, this level involves replacing old products with new ones, introducing line extensions, making improvements to current products or services, bringing some newness to the market in order to stay in the game.
- Contributing to fairly small improvements to products or to the way things are done
- e.g Samsung s1 to s20 series

Breakout innovation:

- These are innovations by which companies break out from the crowd, taking the lead within an existing category.
- These types of innovation often require some degree of internal changes within organization.
- Causing a fundamental transformation in the resulting products or services and or the process technology of an entire industry.
- E.g Nike shoe (light weight, breathable, supportive)

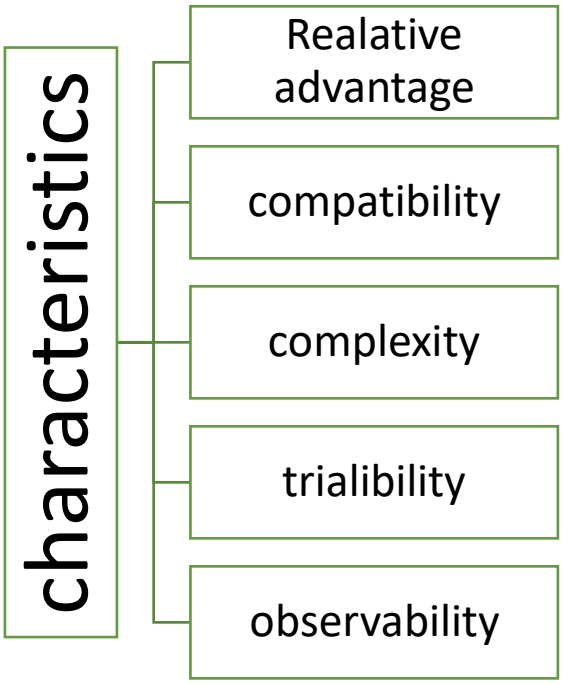
Breakthrough innovation:

- Transforming the market place and or economy as a whole
- Breakthrough innovations are innovations that creates a significant change in the market
- Often making old solutions and categories obsolete over the short or long term
- Breakthrough innovations require new business models and whole new ways to serve customer needs.
- e.g from gramophone to iPod



- Evaluation in mosquito Repellents;(breakout and break throughout)

4.7 Characteristics of innovation:



- Relative advantage:
  It is the degree to which an innovation is perceived as better than the idea it supersedes.
- Compatibility:
  It is the degree to which an innovation perceived as consistent with the existing values, past experiences and needs.
- Complexity:
  It is the degree to which an innovation is perceives as relatively difficult to understand and use
- Trialability:
  It is the degree to which an innovation may be experimented with on a limited basis.
  New ideas that can be tried on the installment plan will generally be adopted more rapidly than innovation.
- Observability:
  It is the degree to which the results of an innovation are visible to others.

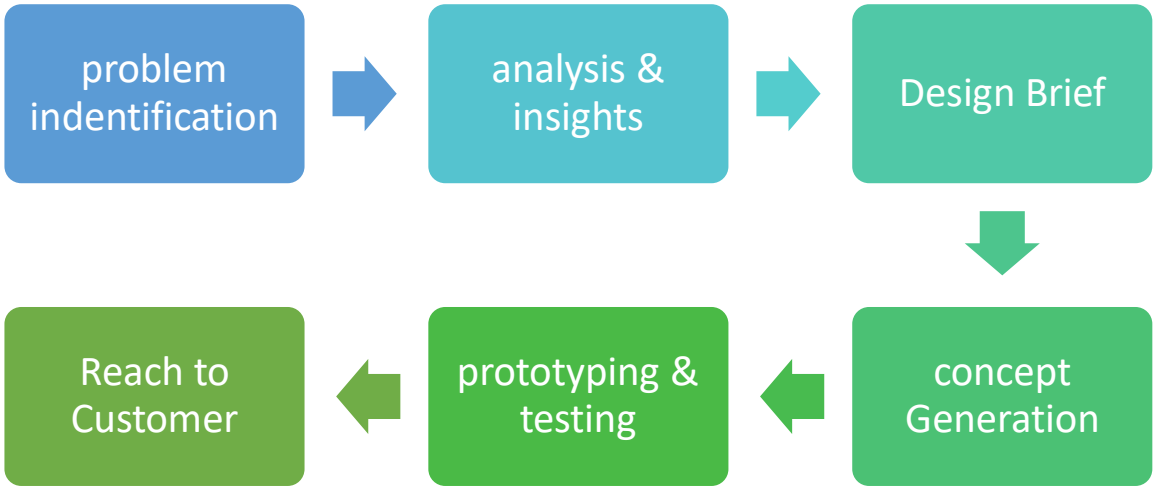
4.8 Five skills of successful innovators

- Observations
- Experimentation
- Association
- Questioning
- Networking

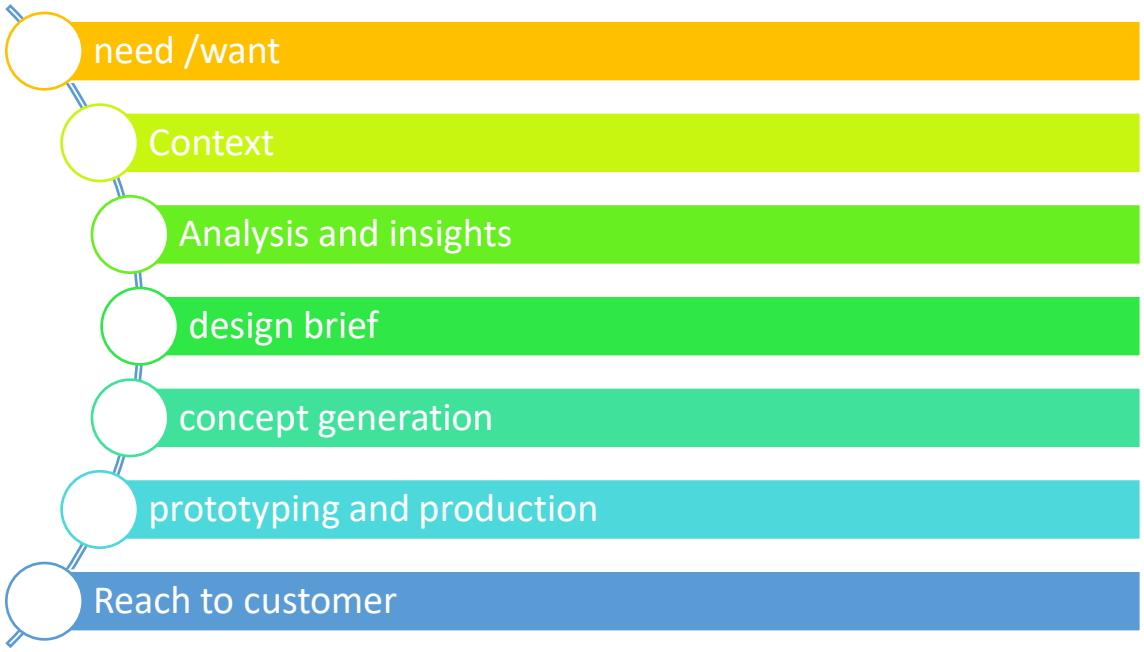
4.9 Myths of innovation:

- ❖ Individuals drive innovation
- ❖ Innovation begins with brainstorming
- ❖ Innovation requires creative people
- ❖ An innovative process will give the results need.

4.10 Innovation by Design process:



Steps in innovation by Design:



4.11 Product

- A product is any good, service or ides that can be offered to a market to satisfy needs or wants
- A product can be tangible or intangible
- A tangible product also has intangible attributes
- Services are a form of product that consists of activities, benefits or satisfaction offered for sale that are essentially intangible and don't result in the ownership of anything.
- E.g
  Tangible product: -pen

Intangible product:

Indian post

- Types of products:
  Products can be consumer products and industrial products
- Consumer products:
  Consumer products are the products purchased to satisfy an individual personal needs or wants
- Industrial products:
  The products which are used as inputs to produce consumer products are known as industrial products.

- Some times same product can be classified as consumer product and industrial product based on the context

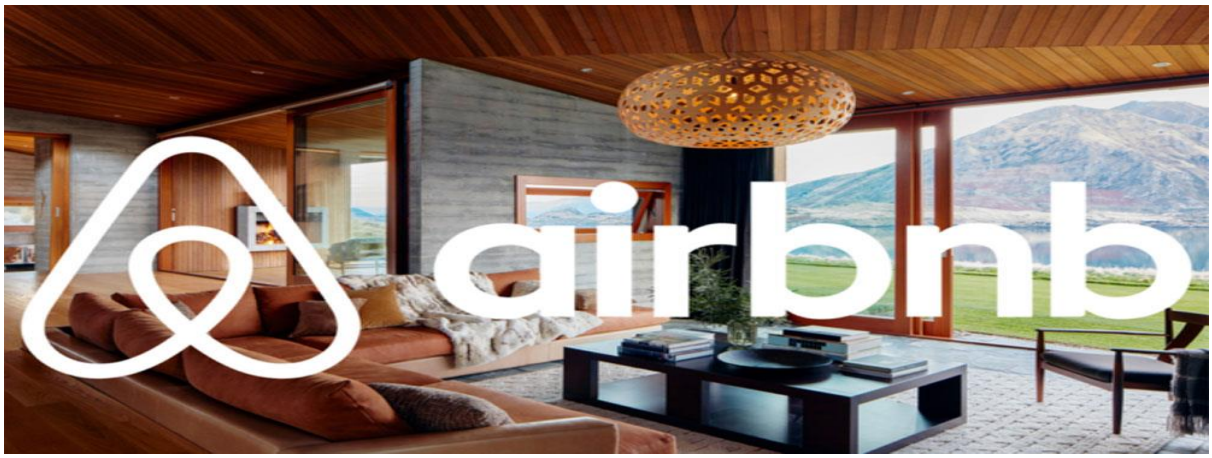
4.12 product innovation:

Definition:

- Product innovation represents a new way of solving a problem a high number of consumers have.
- There may be no products at all on the market that address the issue, or there may be other products already on the market that address it in a different way.
- In order to consider product or solution innovate, designer must be able to answer "yes" to all the following three questions:
  1) Is the product relevant for a significant number of consumers?
  2) Is the product better than its competitors?
  3) Is the innovation or uniqueness of the product obvious?

Why is product innovation Important?

- Product innovation is important because it can help to create new spaces in a seemingly crowded market.
- By identifying the gaps and imposing into a new space, designer can find an audience and satisfy consumer needs in a way that is new and refreshing.
- It is also important to note that product innovation does not always involve the creation of a completely new product that addresses a completely new issue.
- When the first I phone was launched, it established a previously non existing market and satisfying needs that consumers didn't even know they had. Same with the kindle also
- But Amazon managed to re-invent it with new models, for instance, introducing the touch screen
- Innovation may happen when designer improve an existing product or add a new feature to an existing product. E.g when phones got cameras, they gained a new feature
- When talking about product innovation it not only a product, but also to services, processes or business models.
- Airbnb, uber, and Netflix are examples of huge innovation



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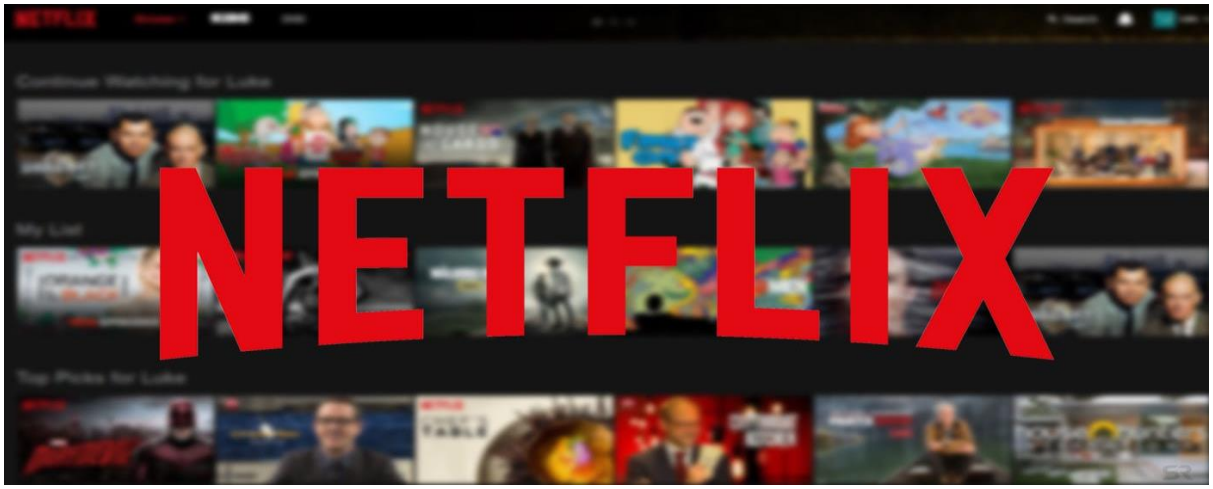


4.13 Materials in innovation:

- The advancements of sustainable materials have not kept pace with this demand, compromising both environmental and economic goals.
- Top brands in fashion, automotive, and home goods are searching the globe for innovative, high-performance materials to satisfy this unmet need.
- Sustainable solutions must be scaled to build a thriving future for brands.
- The material innovation initiate accelerates the development of next generation sustainable materials focus on fibers, synthetics and cellulose and plant-based fibers.
- Consumer are demanding better and more sustainable products and brands and retailers are eager to meet this demand.
- Simultaneously, innovators are working on new technology to serve consumer and brands with improved materials.
- e.g Programmable cement, hydroceramics, bioMason bricks, Alusion panels

4.14 **Case study:**

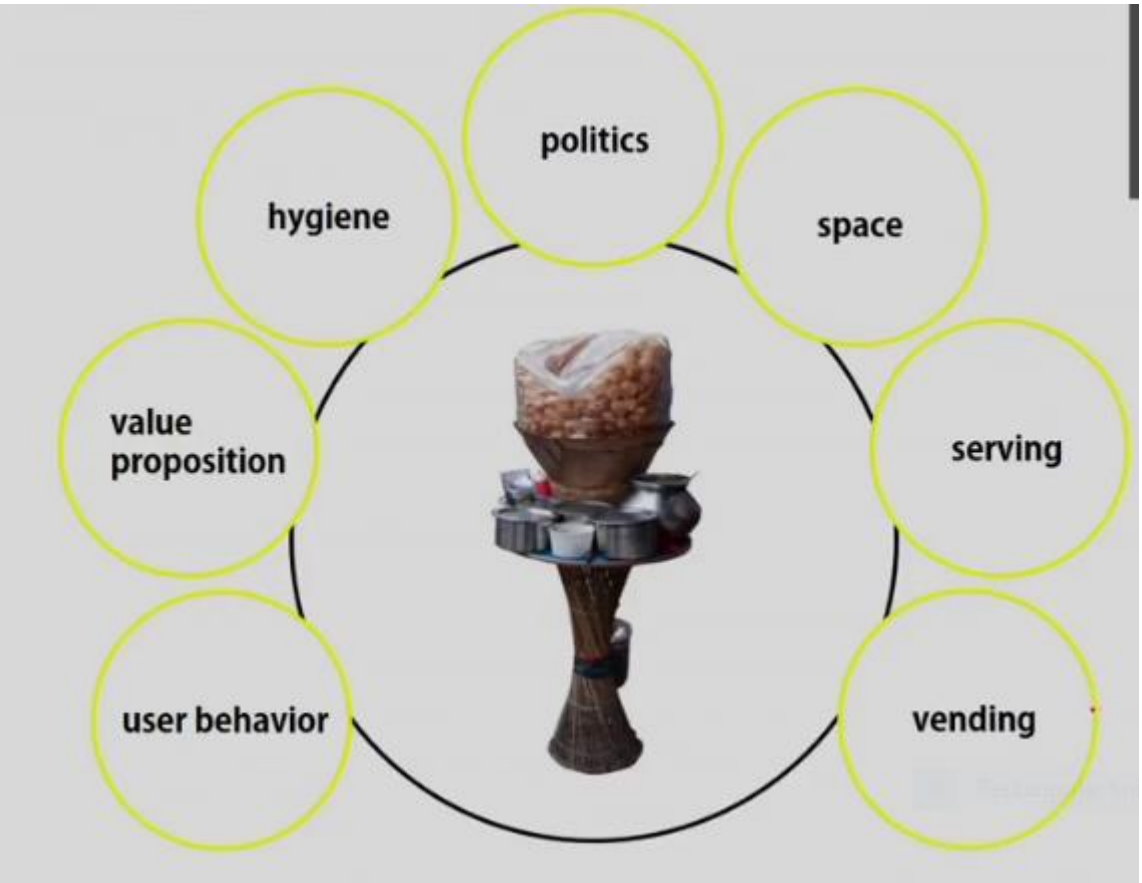
Scenario: Design for lively hood and hygiene for street vending of panipuri

1. Problem identification:

Various complex issues are linked with the street food vending system those are

- legal,
- administrative,
- hygiene,
- space,
- vulnerability of vendors,
- livelihood,
- Indian food habits,
- daily life of the urban poor,
- Indian traditional food,
- culture,
- values,
- competition from other food providers etc

- <u>Focus group techniques and interviews from the vendors figure out various issues</u>



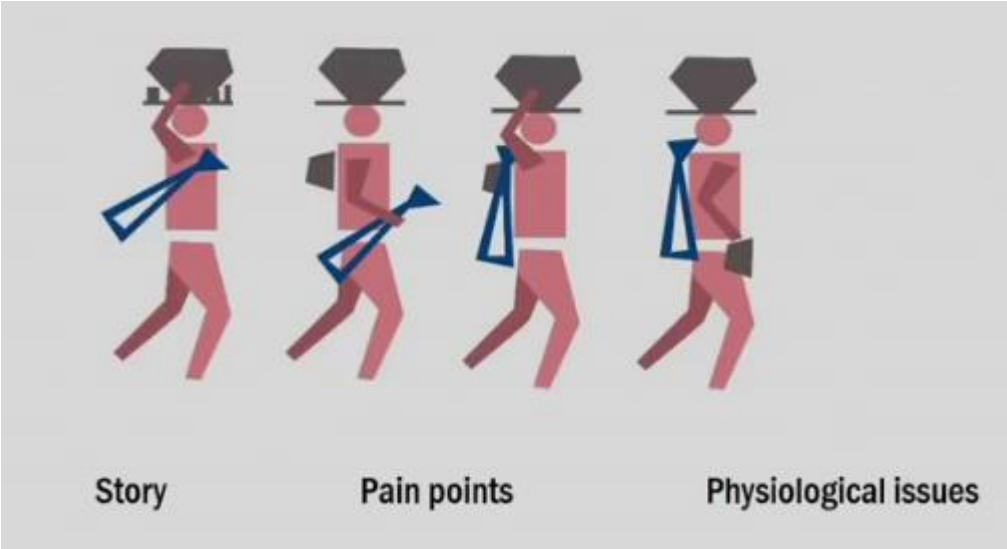
- From vending context, it was observed that vendors can carry the total material (including stand, food stuff, supplements etc) around 40Kg from the vendors house to the selling point
- Through serving situation it was noticed that most of the times panipuri vendors used paper mate bowls.
- The space situation indicates vendors give some token amount(money) to local community
- From politics context, concluded that whenever there is a cart based selling areas in those areas stand are not allowed.
- Hygiene tells the precautions taken by vendors while serving the food, like wearing hand gloves etc. it was observed that vendors are not wearing the glove every time.
- Value position is connected to users(customers). i.e., if ten different vendors are there it creates confusion to the users where to go .it tells unique selling properties.
- In User behaviour observed that the way vendors are display the food items, various types of displays

❖ After observing all these factors, it was narrow down to issues vending and selling.

2. Analysis and insights:

- Four different types of carts are used:
    I. Stand cart
    II. Two-wheeler push or pull cart
    III. Four-wheeler wooden cart
    IV. Four-wheeler metal cart

- Check the journey of the vendor from their home to point of sale.
    a) Journey stories
    b) Figure out pain points
    c) Physiological issues

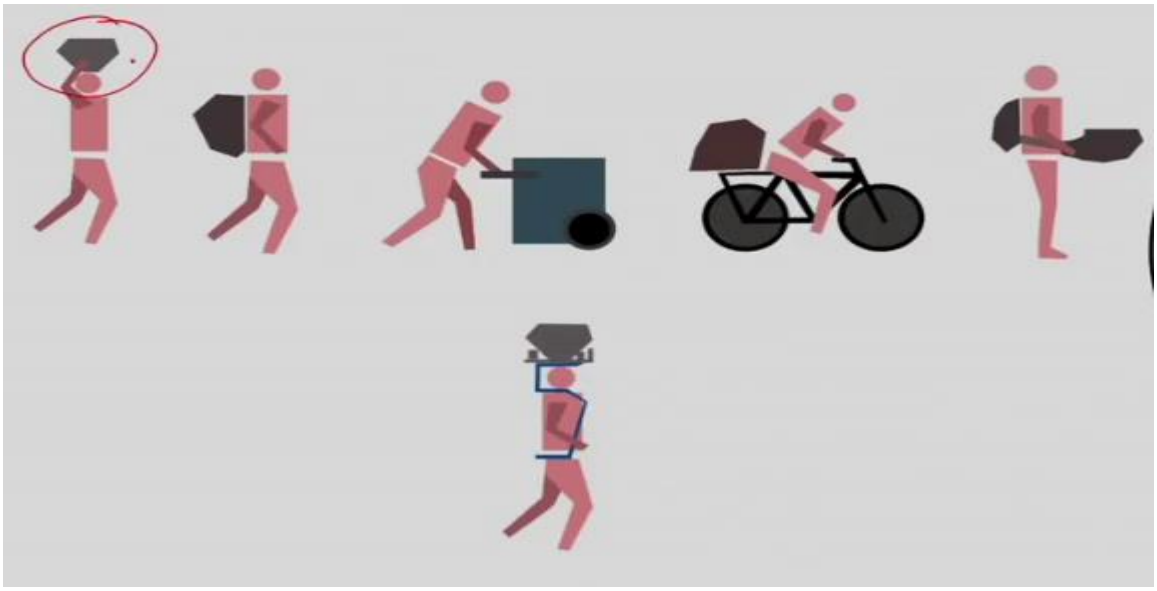


3. Design Brief:

Target consumer:	Panipuri vendor
Problem statement:	Because of cost effectiveness stand carts are most popular among panipuri vendors across India. But long span of load creates physiological issues on various body parts. A cart is required which can address physiological issues in panipuri vending
Design statement:	Design and develop a stand cart for panipuri vending, which would not cause physiological issues
constraints	• Cost should not exceed 1000/-

	• Less weight • Easy to carry and lift • Material and manufacturing process should not effect cost

4. Concept generation:

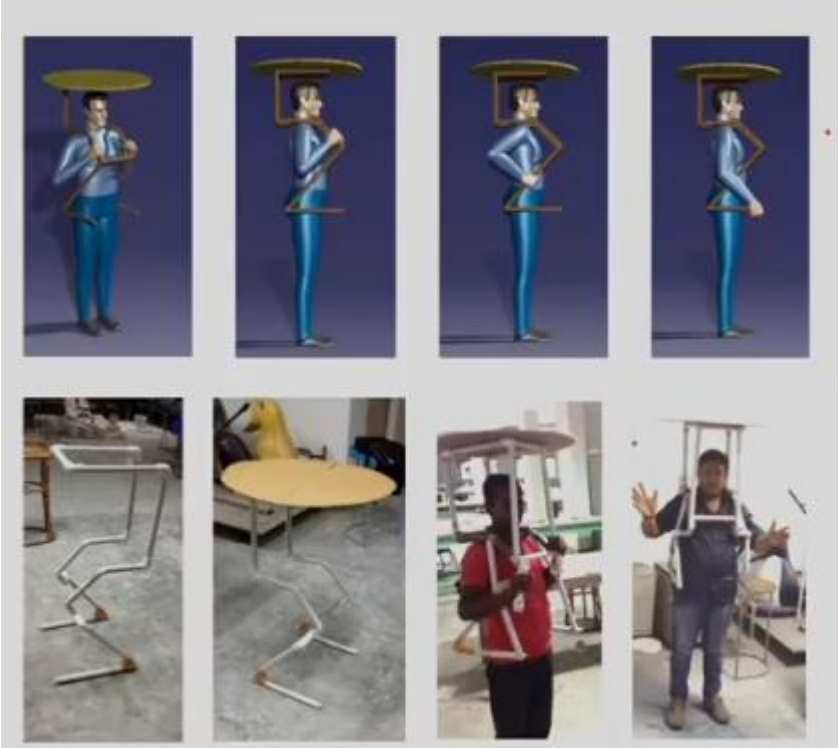


- Most of the vendors they are carrying load on head.
- The other alternates are sharing load on back side, bicycle, and shared the load on two sides
- Looking for other alternative design through innovation.

5. Prototyping:

- Prepare different wire frame models
- Different forms for comfort and feasibility

6. Testing:



- Virtual testing
- Physical testing with user
- Check the comfort by using digital user software

7. Reach to customer:

- Final product

- Cushing material is used where body is contact with cart
- Load is not directly coming to the head

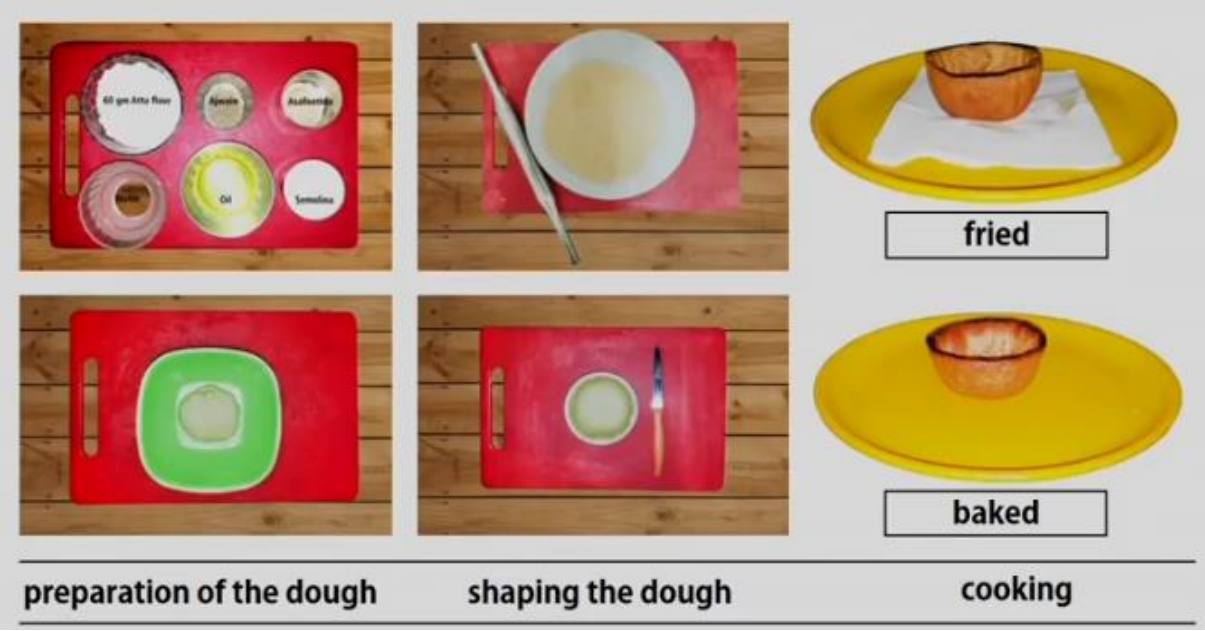
8. Analysis and insight for serving problem:

- Studied various types of bowls available in the market for serving purpose.

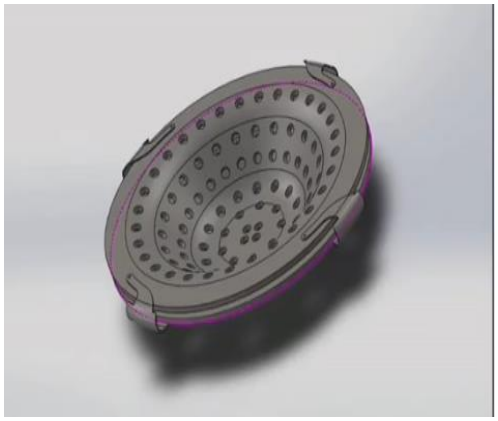
	Material	Good for health	Generate waste?	Biodegradable?	Recycle?	Cost	Have to make/buy
	Paper with Aluminum foil	Yes	Yes	Partly Yes	No	Compare to Magazine paper high	Buy
	Polystyrene foam (Thermocol)	No	Yes	No	No	Compare to Magazine paper high	Buy
	Leaf	Yes	Yes	Yes	No	Compare to Magazine paper high	Buy
	PVC	No	Yes	No	No	Compare to Magazine paper high	Buy
	Clay	Yes	Yes	No	No	Compare to Magazine paper high	Buy
	Magazine paper	No	Yes	Yes	No	The cheapest	Make
	Wafer	Yes	No	NA	NA	Compare to Magazine paper high	Buy

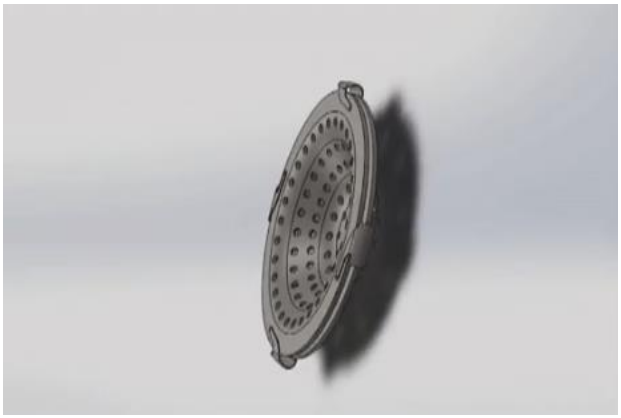
- Comparative analysis is done whether the bowls are good for health or not
- Check whether it is biodegradable
- Check whether it is recyclable
- Check the cost and how to make it
- Compared to paper bowl remaining bowls are good but cost based
- Wafer bowl is eatable but when panipuri come in contact with wafer bowl its losses the experience
- To make remedial solution to this prototype with protocept concept

- Product developed in lab to meet the promise of the product concept



- The fried is crispy and attain good experience of panipuri
- Baked is fine but not easy to eat.
- This be prepared in mass production with computer modeling die





Conclusion:

The final model of stand cart and bowl is used to meet the requirements through process innovation

4.15: Design thinking to innovation

- Design Thinking should not be implemented as rigid approach.
- Instead, it should manifest as a mindset that is useful where innovative ideas are needed.
- It can also be used to augment or support other tools and methodologies to drive progress.
- Innovation is the driving force that continuously redesign businesses and design thinking is the road towards introducing creative solutions to numerous business challenges.
- It is best suited to address complex issues rather than fast, simple answers
- Though implementations will vary from one organization to the next, all follow the basic five-modes of design ti implement new ideas in problem -solving.
- By creating a design mindset in organization to develop a workforce that is focused on producing the innovation to stay a head of the competition