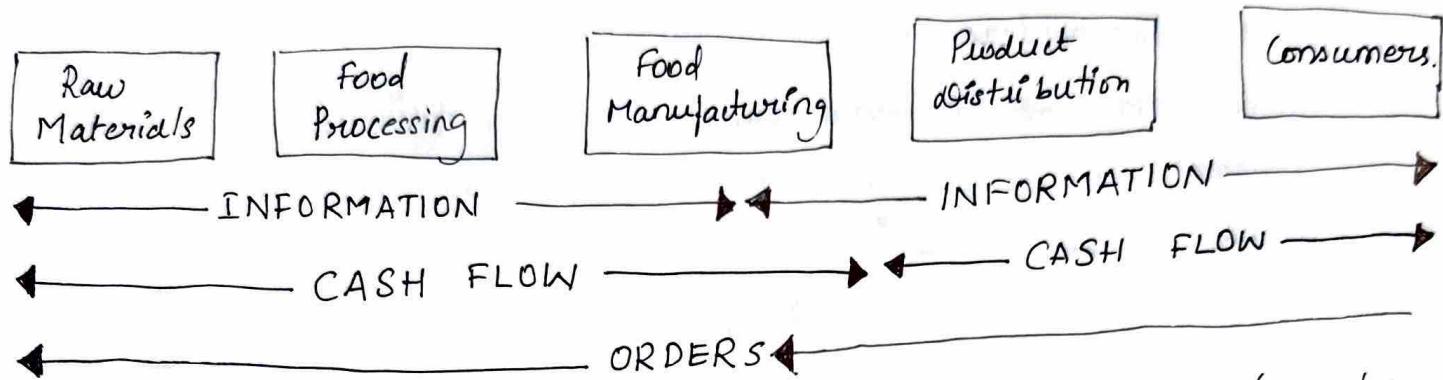


- Ans:
- A Supply chain is a network of establishments that purchases raw materials, converts them into intermediate goods, finished products and then distributes the products to clients.

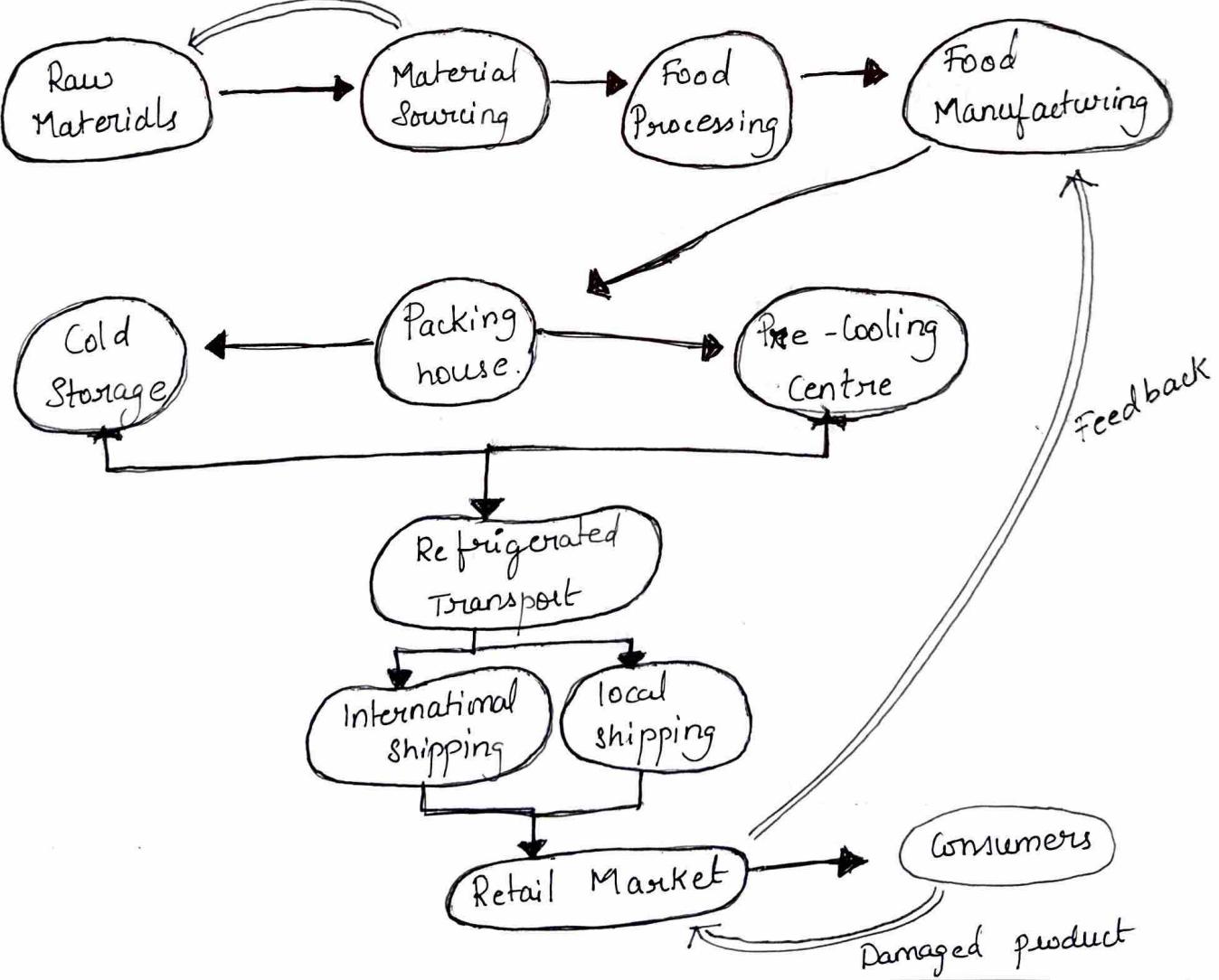


The above diagram depicts the flow of information, cash and orders involved in the frozen food chain

- The key actors involved in the frozen food supply chain are mentioned below
  - Farmers: They are responsible for providing the raw materials to the supply chain.
  - Food Product distributors: They are responsible for distributing the food products to various sale outlets all over the world or locally.
  - Consumers: They purchase the final food product from the sale products.
- The key decision activities need in the frozen food supply chain are.
  - Disaster Prevention Plan: A planned program that is periodically established and evaluated to determine actions to mitigate disaster risk
  - Preventive Maintenance: Regular and scheduled maintenance of equipment and facilities to avoid downtime due to unexpected equipment malfunction.

- Continuous Training: continuous training program to help personnel improve skills and knowledge required to minimize vulnerabilities and avoid dangerous repeat errors.
  - Supply chain coordination: engagement collaboration between companies or stakeholders in a supply chain in sharing resources and information to achieve common goals with a focus on customer satisfaction.
  - Forecasting supply chain: accurately predict future patterns in supply, demand and price of products in the supply chain.
  - IT Utilization: adapt the use of technology involving devices or computer systems related to software, applications, storage and networks, for better management.

- The process flow of frozen food supply chain is as follows.



## Question 2

2) Virtual integration represents the substitution of ownership with partnership by integrating a set of suppliers through information technology (IT) for tighter supply chain collaboration. Virtual integration plays a role in facilitating manufacturers to achieve greater manufacturing flexibility & comparative cost advantage.

Virtual integration has been proposed as a useful governance structure for countering environmental uncertainty through reduced price uncertainty and lower transactional costs, but it also can result in low flexibility and incur additional administrative & production costs associated with acquired capability/adaptability. Virtual integration has eliminated one of the major problem of organizing and maintaining a competent and flexible supply chain to manufacturers in today's increasing competitive and uncertain environments.

→ Applying B2B, B2C, C2B, C2C types of ecommerce in frozen food supply chains.

Technology has been advanced at a rapid pace in the recent years with many internet applications available in the market. Different Business models require different online platforms to be integrated.

① B2B Business Model: This takes place between two companies or business. It has good market predictability & more stability. Under B2B sales is made in bulk amount this model leads to lower cost for the business, the best example of this type of business model in India is IndiaMart intermesh which is a wholesale B2B marketplace. It offers millions of products to its customers which includes frozen foods like meat, Vegetable, snack items etc.

② B2C Business Models: B2C Business model is a model that refers to business that sell their services or the products directly to the customer who are the end users of the products or services.

there is an ongoing demand for the products as it provides the essential items, this thus eliminates the risk of fluctuations in demand and helps in maintaining consistency in the business. Since direct contact is there with the customer's so information is shared with them directly and easily.

Customers are given products at a low price compared to its competitors for the business to run smoothly.

Example of business to customer model is Avenue Supermart which provides goods directly to its customers.

③ C2B Business Model: A relatively new concept thanks to the advent of the internet, a C2B business Model refers to an individual selling services or products to a business. Individuals typically utilize freelancer platforms like Fiverr & Upwork to offer services and goods. Big Basket is an e-commerce website in India where customers (farmers) can sell their products directly to the Big Basket who provides an online platform.

④ C2C Business Model: C2C refers to transactions between customers. With this business model, individuals can sell, buy and exchange services and goods. Individuals often use a marketplace such as eBuy or Etsy, facebook marketplace to buy and sell items. Farmer's Market is one such place in Canada where farmers get their products like frozen foods and consumers like us directly buy from the farmers.

→ To choose the appropriate business model, first try to understand the customer, understand your value proposition, sell your product in a way that makes sense for your customers. All the Business Models are good for the frozen food supply chain but one need to choose appropriate one based on the above principles. The person also requires an appropriate online platform as a bridge between supplier & consumer.

## Q4: Minimizing I wastes in Supply chain:

### \* Unnecessary inventory:

There are plenty of inventory-management technologies designed for the food market. few of them are below

- clear planning for expected peak periods
- SCM software can help track the availability of goods and we can make inventory adjustments with low risk levels.
- Get a good inventory Count: which means if we don't have a proper warehouse items detail then we have to do a full inventory count.

⇒ Put someone in charge: ⇒ have someone in charge responsible for goods which are most in danger of spoiling.

⇒ Understand root cause of the problem: Based on customer's demand, get the correct Suppliers.

✗ FIFO strategy : Sell the oldest products

first.



⇒ Over production:

✗ Use data analytics : to forecast demand and plan production. By analysing historical sales data, market research, industry needs

✗ Optimize production planning: Efficient production planning can help prevent from over production of frozen foods.

✗ Use technology: Technology can be used to prevent overproduction by using automation.

✗ Minimize lead times: Shorter lead times can help prevent overproduction

✗ Monitor inventory levels: Regular monitoring of inventory levels can help prevent over production.



## \* Unnecessary transportation

- Optimize transportation routes - planning efficient transportation can help minimize unnecessary travel and reduce costs.
- Use temperature-controlled transportation - maintaining the temperature of frozen food products during transportation and improve product quality such as refrigerated trucks or containers can help prevent spoilage.
- Improve communication - effective communication between different stages of the supply chain can help prevent unnecessary transportation by ensuring that products are delivered to the right place at the right time.
- Use real-time tracking : Real time tracking of shipments can help prevent unnecessary transportation by providing visibility into the

location and status of products in transit.

→ Minimize hand-offs: It can be achieved by Using direct-to-customer delivery, reducing the number of warehouses and distribution centers, and optimizing truck loading and unloading processes.

\* Focus motion:

→ Use proper packaging - Packaging should be designed to minimize the movement of the product, absorb shock and vibrations and provide support during transportation and handling.

→ Implement technology: for example advanced sensors can be used to monitor the movement and vibration of products during transportation, helping to identify potential issues before they occur.

→ Monitor product condition: Regular monitoring

of product condition can help prevent and humidity levels, as well as checking for signs of physical damage during transportation and storage.

→ Training personnel: personnel involved should receive adequate training to prevent excess motion in the frozen food supply chain.

#### \* Underutilization of employees:

→ Implement effective scheduling - It will help by ensuring that the right number of employees are scheduled to work at the right time.

→ Cross train employees - providing training with the skills to perform multiple jobs.

→ Offer training and development opportunities - It will help employees to keep engaged and

motivated and can lead to increased productivity.

- Implement performance based incentives - giving incentives to employees can make them work harder and more efficiently.  
If includes bonuses for meeting targets or rewards.
- Monitor employee productivity : It will help managers to take corrective action such as providing additional training or reassigning employees to more suitable roles.

## DEFECTS:

=> Defects in frozen food supply chain can lead to food spoilage, safety risks and customer dissatisfaction.

Steps to prevent:

1) Implement quality control measures:

& including during production, storage and transportation.

& involves regular inspection of products and equipments.

2) Use proper packaging:

& very important for frozen food supply chain.

& should be packed in such a way that the temperature is maintained.

& package helps from contamination, against physical damage.

& package helps to withstand the rigors of transportation and handling.

\* Train personnel:

\* Should receive adequate training to prevent defects in the frozen food supply chain.

\* Includes training in food safety and quality control measures, also proper handling and storage procedures.

\* Implement technology:

\* Technology can be used to prevent defects in the frozen food supply chain.

Eg: Sensors can be used to monitor temperature and humidity levels, reducing the risk of spoilage.

## Waiting

Waiting in frozen food supply chain can increase cost and decrease efficiency.

### 1) Optimising inventory management:

- ❖ Includes forecasting demand, maintaining accurate inventory levels, and ensuring that products are available when needed.

### 2) Improve communication:

- ❖ Effective communication between different stages of the supply chain can help prevent waiting by ensuring that products are delivered at the right time.

- ❖ Achieved through better collaboration between suppliers, manufacturers, and distributors, and through the use of advanced technologies.

### 3) Reduce lead times:

- ❖ Reducing lead times can help prevent waiting in frozen food supply chain.

- ❖ Can be achieved by improving prod. and transportation process, reducing time

## Q3: TREND, SEASONALITY, CYCLES IN DEMAND PLANNING

### IN FROZEN FOOD SUPPLY CHAIN:

To address trend, seasonality and cycles in demand planning in <sup>frozen food</sup> supply chain, we can use the following techniques.

#### 1. Historical Data Analysis :

The first step in addressing trend, seasonality and cycles in demand planning for frozen foods is to analyze historical data to identify patterns and trends. By analyzing past sales data and inventory levels, you can identify patterns in demand that can help you forecast future demand more accurately.

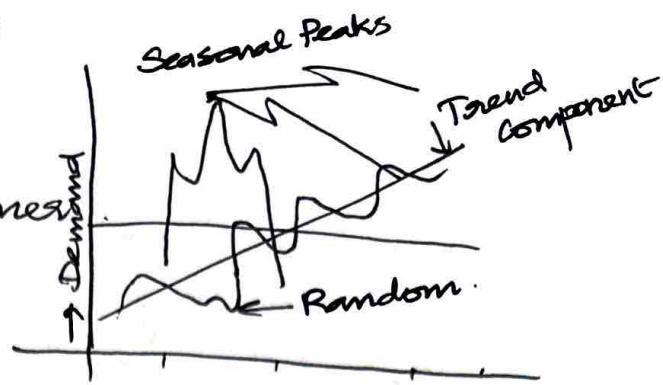
#### 2. Seasonal Indexes :

Frozen food demand is often subject to seasonal fluctuations, so it is important to use seasonal indexes to adjust for these seasonal variations. By using seasonal indexes we can adjust our demand forecasts to account for the predictable changes in demand that occur at different times of the year, such as increased demand for frozen food during the winter months.

Calculating Seasonal Index:

(Eg: Summer)

$$\left( \frac{\text{Actual}}{\text{Forecast}} \right) \text{ for Summer}$$



### 3. Collaborative Planning: → Years

Collaborative Planning can help to align demand with supply and reduce inventory costs in the frozen food supply chain. By working with customers, suppliers and other stakeholders, we can develop a demand plan or forecast that takes into account trends, seasonality and cycles and helps ensure that the right amount of inventory is available to meet customer demand.

### 4. Demand Sensing:-

Demand Sensing approach uses real time data to adjust demand forecasts on a more frequent basis such as daily or weekly. In frozen food supply chain, demand sensing can be particularly useful as demand can be affected by factors such as weather conditions, events and holidays.

Demand Sensing can be implemented in frozen food supply chain by following the below steps.

\* Gather Real-Time Data:

Collect real-time data from a variety of sources such as point-of-sale (POS) systems, social media, weather forecasts and online search trends. This data can provide insights into changes in consumer behaviour and trends that can impact demand for frozen food.

\* Analyze Data:

Using advanced analytics techniques such as machine learning and data mining to analyse the real-time data and identify patterns and trends that can impact demand.

By using these techniques ~~we~~ can easily identify changes in demand and adjust forecasts accordingly.

\* Adjust Demand Forecasts:

Based on insights gained from analysing real-time data, adjust the demand forecasts on a more frequent basis. By doing so we ensure that we have the right amount of inventory on hand to meet changing customer demand.

For example, if a weather event is forecasted, you can adjust our demand forecast to ensure that we have enough inventory available to meet increased demand for frozen food.

## 5. Regression forecast:

It can be a powerful tool for demand planning in the frozen food supply chain. By identifying the factors that influence demand and building a model that captures these relationships, we can make more accurate demand forecasts which can help optimize inventory levels, reduce waste and improve customer satisfaction.