**BEER GAME:**

1. Project some of the graphs and show the results. The column of inventory backlog charts shows the materials flow between the four supply chain roles and the column of orders shows the information flow.

A struggling Root Beer brewery learns about supply chain management and inventory control through the Root Beer Game simulation, and then implements what they've learned to improve their operations and turn their business around.

The Beer Game simulation's inventory and backlog graphs are crucial for understanding the dynamics of the supply chain and the impact of decisions made at each stage. The graphs depict the effects of players' actions on inventory and backlog levels, allowing them to make educated decisions to improve supply chain performance.

The need to decrease information delays and enhance communication between different levels of the supply chain is one of the major insights gleaned from the inventory and backlog graphs. By doing so, players can prevent the bullwhip effect, in which slight changes in client demand cause large swings in inventory and backlog levels.

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Furthermore, the inventory and backlog graphs emphasize the importance of reducing order batching, which can lead to material over- or under-ordering and supply chain inefficiencies. Players can maintain a more precise and timely flow of materials and information by placing smaller, more frequent orders.

Overall, the Beer Game simulation's inventory and backlog graphs provide a good learning experience for grasping the complexity of supply chain management. Players can improve supply chain performance, reduce inefficiencies, and assure customer happiness by examining the graphs and making informed decisions.

1. Why would you go into backlog?

Backlogs can occur in the Beer Game simulation owing to a variety of circumstances, including unanticipated changes in consumer demand, incorrect forecasting, delays in the transfer of information and resources, order batching, and inefficient supply chain management. Let's take a closer look at each of these elements:

Changes in client demand that are unexpected: A sudden spike in consumer demand might catch players off guard, resulting in a backlog. For example, a player may suffer an unanticipated rise in orders that cannot be completed soon owing to a promotional campaign.

Forecasting errors: Players may underestimate or overestimate client demand, resulting in a backlog. For example, if a player underestimates client demand, they may fail to order enough materials to supply it, resulting in a backlog. If a player overestimates demand, they may order too much inventory, resulting in surplus stock and a backlog.

Delays in the flow of information and materials: A backlog might result from a delay in receiving information about client demand or inventory levels. For example, if a player does not receive notification of an unexpected surge in demand, they may be unable to alter their orders in time, resulting in a backlog. Similarly, if a player encounters delays in getting resources from a supplier, they may not be able to play.

Order batching occurs when players place occasional, substantial orders rather than smaller, more regular orders, resulting in a backlog. For example, if a player placed a large order in order to take advantage of discounts or lower transaction costs, they may incur considerable delays, resulting in a backlog.

Inefficient supply chain management: Due to inefficiencies in the supply chain, players may face a backlog. For example, if a participant fails to connect efficiently with other stages of the supply chain, the flow of goods and information may be delayed, resulting in a backlog. Similarly, if a player's inventory management procedures are not optimized, they may encounter a backlog owing to surplus inventory.

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# Finally, in the Beer Game simulation, players may experience backlogs owing to a variety of issues such as unexpected changes in consumer demand, faulty forecasting, delays in the transfer of information and supplies, order batching, and inefficient supply chain management. Understanding these variables and implementing preventative measures can help players maximize supply chain performance, decrease inefficiencies, and satisfy consumer demand more effectively.

1. Why would you accumulate excess inventory?

# Excess inventory may accumulate in the Beer Game simulation for a variety of reasons, including order batching, information delays, a lack of confidence, a lack of visibility, lead time variations, and the cost of ordering.

# Order batching is a typical reason for players to have too much inventory. Players may submit huge orders to save money on shipping or to take advantage of economies of scale. However, if demand is lower than predicted or there is a delay in the delivery of materials or products, this might result in surplus inventory. Due to information delays, players may also collect extra inventories. Over-ordering and surplus inventory can originate from inaccurate or delayed information regarding consumer demand or inventory levels.

# Another reason why players may amass surplus inventory is a lack of trust. Players may lack confidence in the ability of other levels of the supply chain to deliver materials or products on time, resulting in excess inventory as a buffer against future delays. Furthermore, a lack of visibility might lead to players amassing an excessive amount of stuff. If players lack complete visibility into the supply chain, they may be unaware of current inventory levels or estimated delivery dates, resulting in over-ordering and surplus inventory.

# Another issue that might contribute to excess inventory is lead time variability. Excess inventory may be accumulated by players to compensate for variations in lead times, which can be caused by transportation or production delays. Finally, players may amass extra inventory in order to lower the cost of ordering.

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Excess inventory, on the other hand, can have negative implications such as increased expenses, decreased profitability, a negative impact on cash flow, and waste. Excess inventory can obscure problems in the supply chain, making it difficult to pinpoint the core reasons of excess inventory. Furthermore, excess inventory might result in obsolescence or waste, lowering profitability.

On the other hand, not having adequate inventory can lead to stockouts, which can lead to lost revenue and reputational damage. Players can improve communication with various stages of the supply chain, use measures to reduce order batching, use inventory optimization techniques, and address the core causes of excess inventory to optimize inventory levels. Players can improve supply chain performance and reduce negative effects by implementing these steps.

1. Please identify common elements of the inventory/backlog graphs. What are the phenomena you observed?

Inventory and backlog graphs are critical tools in supply chain management for monitoring and optimizing inventory levels and customer order fulfillment. These graphs chart the inventory and backlog levels over time, helping supply chain managers to observe production and demand trends and patterns.

Inventory and backlog graphs in the beer root game show the inventory and backlog levels for each round of the game. The inventory level is the amount of beer currently available in the inventory, whereas the backlog level is the number of orders received but not yet fulfilled. The graph's horizontal axis indicates time, which is divided into rounds.

The bullwhip effect is one of the phenomena found in the inventory/backlog graphs. This happens when slight fluctuations in demand at the consumer level cause larger swings in demand at the supplier level. This can be seen in the beer root game as unexpected surges in the backlog level. For example, if demand spikes unexpectedly owing to a promotional event or a shift in client preferences, the backlog level may rise as suppliers struggle to meet the additional demand.

Inventory oscillation is another phenomenon seen in the inventory/backlog graphs. This happens when inventory levels fluctuate between high and low levels as a result of variations in the production and demand rates. Many variables can contribute to this, including changes in client demand, production delays, or supply chain interruptions. Inventory oscillation in the beer root game can result in surplus inventory or stockouts, which can have an influence on customer satisfaction and the company's bottom line.

Finally, inventory depletion is a regular occurrence in inventory/backlog graphs. This happens when the inventory level reaches zero and there is a backlog of orders to fill. Inventory depletion in the beer root game can result in lost sales and dissatisfied customers. Supply chain managers must monitor inventory levels and change manufacturing and supply chain activities accordingly to avoid inventory depletion.

Finally, inventory and backlog graphs are critical tools in supply chain management for monitoring and optimizing inventory levels and customer order fulfillment. The beer root game is an excellent way to learn about the importance of inventory and backlog graphs, as well as the different phenomena that may be noticed in these graphs. Supply chain managers can enhance efficiency, reduce costs, and improve customer satisfaction by recognizing these occurrences and adapting supply chain procedures accordingly.

1. What are the root causes of these difficulties?

The troubles seen in the beer root game's inventory and backlog graphs can be caused by a multitude of circumstances. Here are some of the underlying causes of these issues:

Inadequate Communication: Inadequate communication among supply chain stakeholders can result in erroneous demand forecasting and wasteful production planning. Stockouts, excess inventory, and extended lead times can occur when suppliers and manufacturers do not have a clear grasp of demand levels and production plans.

Inaccurate Demand Forecasting: Forecasting demand is a vital operation in the supply chain, and poor forecasts can lead to inefficiencies and issues managing inventory levels. Overestimation of demand can result in surplus inventory, while underestimation can result in stockouts and lost revenues.

Transportation Delays: Delays in transportation might result in lengthier lead times and stockouts. Factors such as traffic congestion, bad weather, and mechanical problems can all create transportation delays.

Natural disasters, labor strikes, and supplier bankruptcies can all disrupt the supply chain, resulting in inventory imbalances and extended lead times. These disruptions might also have an impact on consumer satisfaction and the bottom line.

Excess inventory, stockouts, and inventory fluctuation can all result from poor inventory management methods. Inadequate inventory management can be caused by a variety of factors, including erroneous demand forecasting, insufficient inventory control procedures, and ineffective supplier management.

Supply chain managers can establish suitable measures to lessen the impact of these challenges on the supply chain by recognizing the fundamental causes of these difficulties.

1. What are the backlog costs? What do they correspond to in real life?

Backlog costs are the expenses incurred as a result of failing to meet customer demand due to production delays, stockouts, or other supply chain interruptions. Backlogs arise when a company's ability to supply products within the planned timeframe exceeds customer demand, resulting in unfilled orders and disgruntled customers.

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Lost Sales: Lost sales can occur when a company is unable to fulfill client orders due to inventory constraints or production delays. Lost sales are a direct cost to the company since prospective revenue is not achieved.

Rush orders are orders that must be accelerated owing to stockouts or manufacturing delays. Rush orders can be costly since they frequently necessitate special handling and shipment, and they can disrupt other manufacturing schedules.

Overtime: Because workers are obliged to work longer hours to satisfy demand, production delays and rush orders might result in increased overtime expenditures. Overtime is costly and has a negative influence on staff morale and productivity.

Expediting costs are the costs of expediting shipments, such as airfreight charges, rush shipping fees, and other expenditures connected with getting products to clients quickly. These costs might be substantial and influence the company's bottom line.

Customer Service Fees: When customers encounter stockouts or delivery delays, they frequently contact customer service for assistance. These calls can be time-consuming and costly since customer support professionals must answer client difficulties and offer order progress updates.

Backlog costs, in short, are the expenses associated with failing to meet consumer demand, and they can take many shapes in practice. Companies may reduce backlog expenses and improve customer satisfaction by managing inventory levels, enhancing production planning, and strengthening supply chain partnerships.

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