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Evaluating Retail Distribution Strategies During Covid-19 Pandemic in South Africa Using Best Worst Method Multicriteria Decision Technique.

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Abstract

This paper evaluates the distribution strategies adopted by South African retailers during the Covid-19 pandemic and how such strategies have been adjusted for a more resilient post-Covid-19 world. Using the Best Worst method multicriteria decision technique and exploiting data collected from decision makers from the retail industry to rank the distribution strategies according to their level of importance, we show that omnichannel distribution strategy ranked highest, followed by direct shipment distribution capability in contributing to the success of retail distribution during the Covid-19 pandemic. On the other hand, inventory pooling, transhipment, centralised or decentralised strategy, and cross-docking ranked lower while retail distribution strategy was lowest ranked. Finally, particular emphasis must be placed on the critical factors identified in the evaluation in terms of their challenging dimension and impact as they pave way for a more capable retail resilience distribution capability.

Keywords

Distribution strategies; retail organisation; Covid-19; BWM; South Africa.

1. Introduction

The Covid-19 pandemic brought with it different degrees of challenges for South African retailers in respect of their distribution strategies. One of the key challenges presented by the Covid-19 pandemic and subsequent lockdowns was the disruption of the global supply chain network which inherently affected retailers. South Africa's lockdown was among the strictest in the world, which impacted on the retail sector. Organisations in the retail sector had to adjust and innovate in ways that had not been seen in recent years to cope with the impact of the pandemic. Researcher [69] described retail operations as the 'ultimate' component in a supply chain, which was also among the most affected during the pandemic. This is because retailing is the process of promoting products of different manufacturers in a form that is most convenient and accessible to ultimate customers [6]. Retail distribution therefore bridges the gap between a manufacturer's specialized products and its varied consumers, thus enhancing both the value of the product and the service [50]. As the third largest sector in the South African economy, retail operations contribute approximately 15% and 20% to the gross domestic product and employment, respectively [12]. South African retailers were forced to adopt innovative distribution strategies to meet the demands of their

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customers ([20], [47]). In this paper, we evaluate the distribution strategies adopted by South Africa retailers during Covid-19 pandemic using Best Worst method (BWM) multicriteria decision technique.

The gradual development of physical distribution and material management from business logistics to an integrated supply chain network is due to realization through a total cost trade-off analysis of the importance of effective physical distribution management and the value of accurate demand forecasting at the retail level [1]. Effective customer service is the main goal of any retail distribution strategy, which significantly influences demand forecasting and management for upstream supply chain efficiency. According to [1], "Supply Chain Management is a set of synchronized decisions and activities used to integrate suppliers, manufacturers, warehouses, all involved transporters, retailers, and final customers more efficiently, all of which help ensure that the right product or service will be available and distributed in the right quantities, at the right prices, in the right locations, in the right conditions, and at the right time, to minimize system-wide costs while trying to satisfy customer requirements for sustained competitive advantage". For this paper, the retail distribution strategy is the planning, implementation and control of the efficient and effective forward/reverse flow and storage of goods, services, finance, and related information from a distribution channel to meet customer requirements for sustained competitive advantage. This definition delineates the study focus on the distribution chain of retailers and does not include members of the upstream supply chain such as procurement, manufacturers/producers, and their suppliers. The rest of the paper is structured as follows: a conceptual framework identifying and explaining the criteria for the evaluation, the methodology, results and discussion, conclusion, and managerial implications.

2. Conceptual Framework

This section identifies the main retail distribution strategies which will be used as the main criteria in the multi criteria decision making analysis.

Trans-shipment

Part of inventory management for both centralised and decentralised system involves its movement between locations and the problem of cost containment. Transshipment may refer to unloading inventory from one vessel and loading to another at a transshipment centre to a destination to ensure timely delivery and reduced cost where there is no direct route. However, inland, it also refers to transfer from one warehouse to another through some logistics depots (urban consolidation centres) [26] or city tolls and delivery time windows [27] in the context of city logistics. Examples include lateral transhipment which refers to the sharing or pooling of inventory within the same echelon [58]. Lateral transshipment achieves cost reduction by ensuring low levels of inventory are maintained and shared horizontally among the members of the same echelon, especially when dealing with perishable or short life inventories such as blood or large items with stochastic demand like machinery parts [58]. In this case, care needs to be taken to ensure availability at short notice while avoiding overstocking. Similarly, during the Covid-19 pandemic, retailers faced intermittent supplies due to lockdown restrictions and had to balance their demand especially with the introduction of online shopping still an unfamiliar channel as well as shifting consumer behaviour [30]. In addition to the shift from traditional to the new digital channels, restrictions during the Covid-19 lockdowns created new demand patterns caused in some cases by panic buying [29] sometimes resulting in stochastic demand which has long been difficult to predict [43]. The unpredictable demand patterns created supply and demand mismatch, and in such situations, inventory transshipment has been proposed as a viable solution to deal with consumer demand-([14],[25]). Accordingly, during a supply chain disruption, inventory transshipment has emerged as an important enabler to minimise supply and demand mismatch.

Omnichannel

The decision about channel selection have become important in a dynamic market characterised by fast changing consumer behaviours and tastes, distribution channels and product offerings [4]. Among other factors affecting consumer behaviour, continuously advancing digital technologies offer consumers varied choices and these have been accelerated by the effects of disruptions such as the Covid-19 pandemic ([44], [67]). The Covid-19 pandemic has transformed the retail landscape and forced organisations to adopt strategies designed to ensure they adapt to the changing consumer behaviour and to guarantee their survival [17]. Among strategies that have proven useful during a disruption is the omnichannel strategy which offers customers a seamless shopping experience between channels, thus customers can switch between channels in a single shopping journey ([17], [67], [69]). The omnichannel is considered an agile way of responding to supply chain disruptions through which customers can move between fully integrated physical and digital platforms within a single shopping experience [69]. As the foot traffic decreased due to Covid-19 induced lockdowns, some stores temporarily closed or permanently shifted to online shopping, while others blended the physical with online shopping ([4], [17], [45]). Thus, with the advent of Covid-19, twinned with advanced digital technologies, the omnichannel has become critical to cater for various consumer behaviours such as pure offline shopping, showrooming, webrooming, and pure online shopping ([55]. Accordingly, it caters for both in-store brick and mortar and online customer service and order fulfilment [5].

Direct Shipment

One of the core objectives of any producer or supply chain management is to minimize the cost of distribution, thus maximizing profit. However, 30% of the supply chain costs emanates from the distribution process [2]. One of the commonly used distribution channels that is more economical and effective in reducing supply chain distribution without accounting for fixed cost is the direct shipment [33]. This advantage of the direct distribution channel makes it one of the appropriate strategies to adopt in difficult times such as the Covid-19 pandemic, where scaling down on cost is necessary. In direct shipment, customers receive all products from the producers or suppliers directly and the suppliers take control of all distribution channels between the producers and the consumers [33]. In as much as the strategy is cost effective and has other several advantages such as higher revenue from sales and direct feedback from customers, it requires a high set up cost which makes it not feasible for smaller companies to adopt. In addition, when a company use intermediaries such as retail or wholesale outlet, where products are shipped directly to consumers, the length of the supply chain between the producer and the supplier increases which may unnecessarily lengthens the delivery time.

Decentralized Distribution

Managing inventory distribution to the downstream customer remains a critical factor in managing costs and is affected by decisions on average inventory holding levels, minimum lead times, batch sizes, supply and delivery uncertainty and product variety [22]. One of the important strategic decisions is whether to decentralise or centralise the inventory distribution channel as part of the distribution design which is crucial for the performance of a manufacturer [35]. A decentralised distribution channel is where an individual retail store makes its own decisions and inventory warehousing is localised ([22], [37]). In a decentralised distribution channel strategy, where various distribution centres are maintained closer to the end customer, there is a better understanding of the

unique regional customer needs and a tailored approach to product offerings is possible. In addition, delivery turnaround times can be shortened to improve customer service at the local level ([22], [40]). On the downside, a decentralised distribution channel strategy has been found to increase costs due to various duplicated costs such as warehousing costs, labour costs, sub-optimum transportation costs and inability to negotiate preferential prices with suppliers on small orders [22] the problems which [22] posits would require local outlets to rely on transshipments to balance their inventory.

Centralised Distribution

The centralized distribution strategy is more appropriate for companies with a wide variety of products which have high volume of sales, thus it is mostly common among large retail chains [23]. The strategy involves a consolidation of all distribution activities from a single location and requires a single decision maker, which is contrary to decentralised distribution. The single decision maker enables the company to solve the problem of double marginalization, which is common among other distribution strategies, thus results the equilibrium outcomes of a supply chain are globally optimized [21]. Other benefits of the centralized strategy include cost-effectiveness [16], better control over the supply chain channels, and an improved Planning. However, in the event of natural disasters such as the Covid-19 pandemic or transportation strikes, there is a higher risk that the supply chain with be disrupted, and this comes with its associated negative impacts on the operations of the business. It will therefore not come as a surprise if this strategy was among the least practice distribution strategies during the height of the Covid-19 pandemic. The centralized distribution strategy has been known to have longer lead-times to stores which subsequently affects production [16]; however, this problem can be solved by the use of crossdocking warehouse strategies by retailer's logistics distribution centres [23].

Cross-docking

Researcher [38] indicates that the distribution process accounts for 30% of the product sale cost thereby increasing overall supply chain processes overheads. Eliminating or reducing storage and other order-picking activities to enhance the flow of the shipping cycle, is therefore desirable. One of the most convenient distribution channels that is tailored for such operation is cross-docking. Cross docking as a logistic procedure is implemented to achieve a competitive advantage reducing time and storage requirements by consolidating and transferring goods directly from an inbound supplier to an outbound customer. The Material Handling Industry of America defines cross-docking as "the process of moving merchandise from the receiving dock to shipping dock for shipping without placing it first into storage locations" [64]. Table 1 below briefly highlights a comparative chart for retail distribution strategies definitions and justification.

Inventory Pooling

Sometimes multiple markets with uncertainty in their demands need to be served from a single stock of inventory [58]. This form of distribution strategy is known as inventory pooling. Inventory pooling could either take the form of location or product pooling. The use of inventory pooling capabilities was rare in the early 2000s, however at the turn of the century cross channel fulfilment programs by inventory pooling were a top strategic priority for retailers. Two aspects that have driven this shift to inventory pooling are maximizing profits and customer expectations. Researcher [57] reports that 62% of retailers invest in such inventory pooling capabilities mainly because of

customer expectation. Researcher [56] reports on how firms can achieve maximum profits with the implementation of an inventory pooling mechanism. Inventory-pooling, inventory consolidation, portfolio effect, and consolidation effect are virtual inventory management. Researcher [34] describes Inventory pooling as "a strategic tool in which consolidating inventory at a central location, instead of stocking products at multiple locations, results in reduced variability among orders and, thereby, a reduced inventory cost". The Covid-19 contingency scenarios show that demand patterns have undergone major changes, some products suffer large increases in the quantities demanded (demand shock), while others suffer an abrupt drop in these quantities requested. This created uncertainty in demands which makes inventory pooling a useful strategy during the pandemic. The strategy is effective in mitigating demand uncertainty [58]. In comparison to other systems, inventory pooling often provides lower costs than when using the independent system of supply [52]. Particularly, when the component of the market demands is negatively correlated, a pooled inventory strategy reduces operational costs and subsequently increases profit [58].

Table 1: Distribution strategies definition and justification

Retail distribution strategies	Definition and justification	References
Direct shipment (DS)	Direct shipment strategies exist to bypass warehouses and distribution centres. Employing direct shipment, the manufacturer or supplier delivers goods directly to retail stores.	[33]; [62].
Centralised strategy (CS)/Decentralized strategy/(DS)	In a centralized system, decisions are made at a central location for the entire supply network. Typically, the objective is to minimize the total cost of the system subject to satisfying some service-level requirements. Centralised control leads to global optimization. In a decentralized system, each facility identifies its most effective strategy without considering the impact on the other facilities in the supply chain. Thus, a decentralized system leads to local optimisation.	[13], [22], [35], [37], [40], [41], [71], [72].
Cross docking (CD)	In this system, warehouses function as inventory coordination points rather than as inventory storage points	[10], [53], [63].
Inventory management pooling (IP)	Pull: By pooling inventory at the central warehouse and pulling from it after customers order a particular vehicle. A push supply chain, in which dealers must order before demand is realized.	[11], [18], [60].
Trans-shipment (TS)	The shipment of items between different facilities at the same level in the supply chain to meet some immediate needs. Trans-shipment capability allows the retailer to meet customer demand from the inventory of other retailers.	[26], [27], [45].
Omnichannel (OC)	Integrated approach across the whole retail operation that delivers a seamless response to the consumer experience through all available shopping channels, be it on mobile internet devices, computers, in stores, on television and in catalogues. For example, drop shipment, click, and collect, store shipment, and click and reserve.	[3], [28], [39], [61], [65].

3. Methodology

3.1 Multi-Criteria Decision-Making method

Evaluating retail distribution strategies during Covid-19 in South Africa requires various multi-Criteria Decision Making (MCDM) methods to facilitate this complex and critical decision-making process. As far as we know, few studies applied MCDM method to evaluate retail distribution strategies during Covid-19 in South Africa. This is critical because a robust decision support tool will enable retailers and government prioritize retail distribution strategies and consequently develop resilient strategies that is helpful in crisis and emergency situations. As we can see, there are many MCDM methods to evaluate retail distribution strategies, such as DEMATEL, AHP (Analytic Hierarchy Process), ANP [48]. However, they all have a common disadvantage, which requires a pairwise comparison among all factors. In other words, n factors need to be compared $n * n$ times. If there are many factors, it will bring difficulties to the evaluation.

These complex comparisons and evaluations will affect the accuracy of the final decision. To obtain a consistent and credible evaluation, [50] developed BWM with less inputs for decision-makers. The ability of the BWM to solve inconsistent and complex evaluations makes it suitable for our study. Many researchers (e.g. [7], [24]) have applied BWM in many different contexts. These application studies suggest that BWM can be a valuable tool.

The BWM process is structured by [50] as follows:

1. Decision-makers determine a set of criteria $c = \{c_1, c_2, ...c_n\}$.

2. Decision-makers identify the best criterion and the worst criterion.

3. Decision-makers compare the best criterion to others on a 1-9-point scale. A score of 1 represents an equal preference between the best criterion and another criterion. Also, a score of 9 shows an extreme preference for the best criterion over another criterion. The outcome gives the Best-to-Others (BO) vector as: $BO = \{aB_1, aB_2, ..., aB_j\}$ where aB_j depicts the preference of the best criterion B over criterion j.

4. Decision-makers compare all other criteria to the worst criterion on a 1-9 -point scale. This result portrays the Others-to-Worst (OW) vector as: $OW = \{a_1W_1, a_1W_2, ..., a_jW\}^T$ where a_jW is the preference of the criterion j over the worst criterion W.

5. BO and OW vectors are substituted into a linear programming problem of the form:

   a. *min ξL subject to*

   $$wB - aBj \times wj \leq \xi L$$
   $$wj - ajW \times wW \leq \xi L \sum wj = 1$$
   $$wj \geq 0, for\ all\ j \qquad\qquad (1)$$

The linear programming problem is solved to get the optimal weights (w_1*, $w*_2$, $\cdots$, w_n*), and $\xi L*$. The $\xi L*$ depicts consistency. There is a higher consistency when the value of $\xi L*$ is closer to zero. This means the comparison is more reliable.

3.2 Background Information

To carry out the field analysis, we recruited some decision-makers (retailers) from the South African Retail industry. We had 12 decision-makers for the case study from different stakeholders and multiple levels to participate in the study to understand the retail strategies used during the Covid-19 (see Table 2). Such a wide variety of respondents can give us a general view of the evaluation of the decision criteria.

.Table 2: Demographic information of decision-makers and firms.

Attribute	Number of decision makers	Sample percentage
Age		
20-29	2	17
30-39	9	75
40-49	1	8
Gender		
Male	7	58
Female	3	25
Other	2	17
Education		
High School	4	33
Diploma	5	42
Degree	3	25
Position		
Manager	8	67
Non-Manager	4	33
Turnover		
Less than R500 000	0	0
R500 000-R2million	12	100
Size		
Medium	3	25
Large	9	75
Age of firm before Covid-19		
Less than 5 years	0	0
More than 5 years	12	100
Sector		
Food, beverages and tobacco	8	67
Pharmaceutical, medical, cosmetics and Toiletries	1	8
Textile and clothing	2	17
Other	1	8

3.3 Evaluation and analysis process

Step 1. Identifying retail distribution criteria

We identified seven first-level criteria through a literature review. Three decision-makers in the South African retail industry interviewed, each with more than five years' experience have validated the first level criteria. They were comfortable and understood these factors. They specified which first level enablers retail are relevant to their organizations. Decisions were allowed to suggest related strategies not included in the literature review. Finally, we summarize seven first level retail distribution strategies for the case study.

Step 2. Identifying the most important enabler and the least important enabler

We conducted a questionnaire survey to collect information from 12decision-makers to identify the most important and least important retail distribution strategy during Covid-19. According to ([47]; [59]), the good number of decision-making experts is between 5 and 15. Our 12 experts met those requirements.

Step 3. Determining the Best-to-Others

We asked each decision-maker to use a 1–9 point scale to determine the scores for the preference of the best (most important) criteria over all other enablers.

Step 4. Determining the Others-to-Worst vectors

Then, each decision-maker determined the scores for the preference of other criteria over the worst (least important) enabler using a 1–9 point scale.

Step 5. Calculating the final optimal weights of enablers

We solved the BWM optimization problem for each decision-maker to determine the optimal weights of the first level enablers. Then, we average the evaluation results of 12 decision-makers to the final optimal weights of first level criteria. All consistency ratios are close to zero, making the comparisons highly consistent and reliable.

4. Results and Discussion

4.1 Results

After applying the criteria contemplated in the evaluation and the analysis process section, the results obtained are summarised in Table 3 and Figure 1. Table 3 shows the final optimal weights for the first level criteria while Figure 1 is a graphical representation of the results.
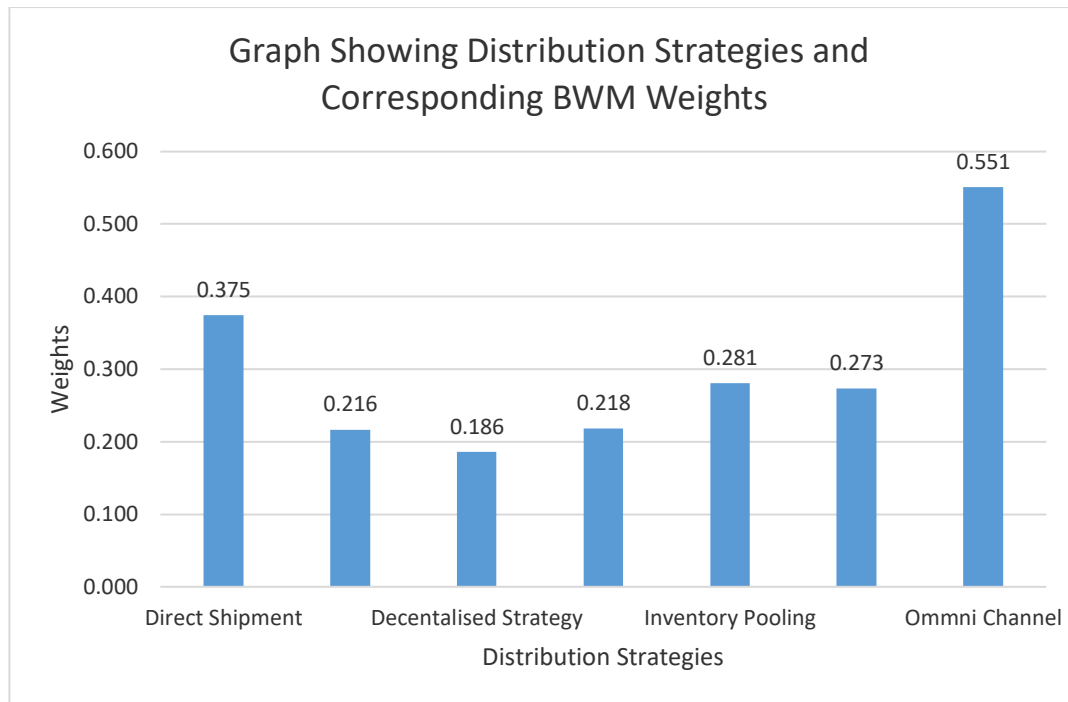
Figure 1 BWM strategies weights and rankings.

Table 3: Evaluation weights and ranking of strategies.

Distribution Strategy	Weight	Rank
Direct Shipment	0.375	2
Centralised Strategy	0.216	5
Decentralised Strategy	0.186	7
Cross Docking	0.218	6
Inventory Pooling	0.281	3
Transhipment	0.273	4
Omni Channel	0.551	1

4.2 Ranking of individual retail strategies

The ranking of the distribution strategies according to their level of importance is detailed in Table 1. From the table, omnichannel was ranked as the highest with a weight of 0.551 implying that it explains 55% of the contribution to the success of retail distribution during the Covid-19 pandemic. Thus, the use of multiple channels (online/mortal stores and online/offline touch platforms) to enhance value delivery of product and service to customers [9] ranks the highest. The omnichannel was introduced into the market environment around 2010 to bridge the gap between mortal stores and digital consumers. In that the objective of omnichannel was to enable seamless shopping accessibility and seamless distribution of orders from any channel the consumers choose to order [15]. This research indicates the importance of omnichannel distribution as the most prominent, fast, and developing demand and order inventory management across the supply chain and physical distribution amongst retailers in South Africa. This also indicates the wide acceptance of electronic commerce.

Direct shipment distribution capability was classified as the second highest with a weight of 0.375 distribution strategy, that is, it explained 38% of the contribution to retail distribution capability. Direct

shipment is the bypass of the usual multiple-stop distribution channel within the supply directly from the manufacturer. According to previous research [36], direct shipping reduces cost and delivery time, considering the Covid-19 social distance scenario and the need for flexible delivery of products and services ([51], [8]). However, one of the enabling factors for direct shipment is the growth of technology and internet connectivity. Interestingly, this enabling factor enhances further the earlier result on the role of omnichannel as a more important strategy as omnichannel is enabled by information technology and the Internet of Things. The need for omnichannel distribution results in coordinated and collaborative supply relationships among retailers in South Africa. Omnichannel not only improves customer satisfaction capability, but also improves distribution visibility toward a more sustained and flexible distribution strategy going forward, especially in the event sudden uncertain and disruption. Apart from flexible and visible distribution operations, the effective and efficiency of omnichannel distribution may require higher level trust, commitment, delivery consistency, quick technological adoption/adaption willingness, information systems improvement, and distribution operations expansion to every region in South Africa to achieve effective omnichannel retail distribution plan.

Other distribution strategies such as inventory pooling, transhipment, centralised or decentralised strategy, and cross-docking were ranked lower than omnichannel and direct shipment. The least ranked retail distribution strategy during Covid-19 according to the findings is the decentralised strategy. These results are consistent with [32] who stated that the transitioning to omnichannel distribution requires a high level of centralisation and integration among retailers. However, on the contrary, these authors went further to state that some element of decentralised distribution strategy is still relevant in omnichannel distribution because of the bricks and mortar store acting as fulfilment centre for pick-up-point, return point.

4.3 Managerial implications and conclusion

This paper evaluates retail distribution strategies using multi-criteria decision-making method of Best to Worst. The results clearly indicate the importance of omnichannel and direct shipment retail strategies during Covid-19. It is important for effective decision making and going forward that retail manager continuously adapt to uncertainty within the market environment. To achieve this successfully, the retail manager should be aware of these distribution strategies and their level of importance to enhance the operations. This is particularly so with the emergence of fourth and fifth industrial revolution in addition with Covid-19 pandemic, which necessitates the need for retail managers to be well prepared in their pursuit for customer satisfaction to adapt and carefully implement appropriate distribution strategies such as omnichannel and direct shipment distribution due to their level of importance among other distribution. Beyond the Covid-19, there is a need to build more resilient capability around omnichannel distribution as far as technology advancement and global digitalisation is concerned. The ranking of distribution strategies according to their level of importance in this research can help the retail manager make an appropriate decision around any of the distribution strategies or combination of more than one distribution strategy listed for efficient and effective seamless distribution performance that satisfy the different delivery needs of the customer or clients. Although this research is limited to ranking importance of retail distribution strategies, it will help the retail manager simplify distribution decision-making efforts and help channel distribution investment priorities in the right direction and with the right suppliers. This will further enhance operational cost savings in strategic operational areas such as inventory carrying costs, transportation costs, warehousing costs, and order processing costs.

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