

THE INFLUENCE OF SEASONAL TRENDS ON E-COMMERCE SALES- AN ECONOMETRIC ANALYSIS

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1. Abstract

The goal of this research is to discover how seasonal trends affect the sales of e-commerce— more specifically, how holidays such as Black Friday, Cyber Monday and Christmas, as well as seasonal transitions like summer and winter. It also focuses on how companies can leverage these trends to better their strategy and increase sales. Some of the tactics include; Marking trends to understand market movements, using AI to predict sales, offering customers specific deals, and making it easier for them to shop via their mobile phones. The peak seasons are full of opportunities that need to be seized, but there are also challenges that come with it, such as inventory management, price competition, and keeping the upper hand over the competitors. Tricks can be used by the companies to boost the sales and exploit the trend is what this study explores. One of the recommendations made is that the influence of different cultures on buying behavior and how emerging technologies may reshape the methods by which e-commerce businesses track these trends also warrants additional research.

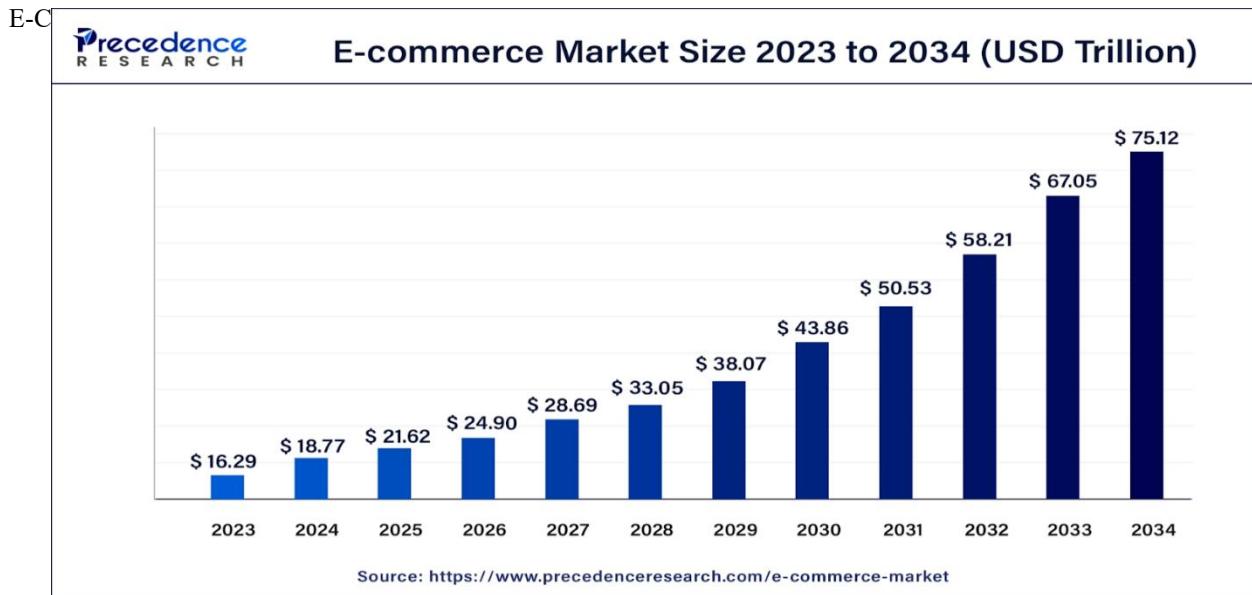
2. Introduction

The phenomenon where consumers repeat certain patterns of behaviour at different times of the year such as during holidays or festivals or changes in weather is known as seasonal trends. For example, there is increased demand for certain products during the back to school season, Black Friday or Christmas. These tendencies affect the business operations especially in the e-commerce sector as the latter's revenues are greatly influenced by the mentioned cyclic patterns.

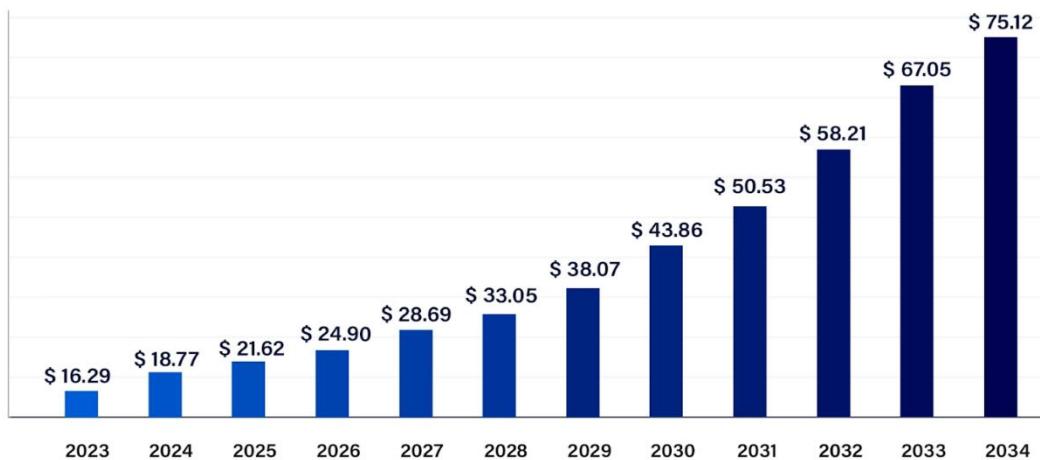
Due to the e-commerce platforms, the shopping behaviour of people has changed and they can buy goods at any time of the year. However, there is a tendency of increased online activity at certain times of the year for example, during the holidays when people take advantage of sales and discounts. For instance, Black Friday in the United States and Singles' Day in China have become global shopping events, setting records for sales year after year.

Understanding the relationship between holidays and seasonal changes and internet purchasing behavior is the objective of this research. Awareness enables businesses to anticipate customer demand, control stock levels, and tailor marketing campaigns to become more productive. It can also reflect how customer attention shifts during different times of the year, such as Christmas or summer.

To remain competitive and to grow sales, E-commerce companies need to recognize and respond to seasonal trends. Businesses can also increase customer satisfaction and profitability through an appropriate change in policy. Research shows, for example, that around 70% of consumers during holidays begin seeking discounts as early as October. This indicates that e-commerce stores need to start preparing long before the peak shopping season starts (National Retail Federation, 2023).



E-commerce Market Size 2023 to 2034 (USD Trillion)



Source: <https://www.precedenceresearch.com/e-commerce-market>

Source: Precedence Research

There is an increase in the e-commerce industry value from \$16.29 trillion in 2023 to \$75.12 trillion by 2034. It is unquestionable that the sustenance of this phenomenon is the effect seasonal patterns have on online shopping. Many people spend money during the festive seasons such as Christmas, Black Friday, and Diwali. This year increased spending is captured by businesses through discounts and other promotional offers. Likewise, supermarket shopping during back to school period, summer sales, and winter clearance days.

3. Literature Review

Given the impact on consumer behavior and the strategies adopted by businesses, seasonal patterns in retail and e-commerce have been the subject of a tremendous amount of attention. On the other hand, data reported in Journal of Retail Economics (2021) demonstrates continued growth in consumer spending on Black Friday, Cyber Monday and on Christmas. These events are heightened by aggressive marketing, deep discounting, and herding behavior that consumers have towards limited time offers, which compel them to spend more.

There is evidence that Cyber Monday and Black Friday phenomena increase new customer acquisition and online sales globally. e Marketer uploaded a report outlining how Black Friday sales alone capture a significant share of the yearly revenue of the eCommerce sector in the U.S. where people mostly spend on electronics, clothing, and furniture (Smith et al., 2019). At the same time, (Lee et al., 2020) reported that platform sales on Cyber Monday often peak due to mid-week incentives for new customers.

A change of season tends to alter consumer behavior patterns too. An increase in the demand for swimsuits, outdoor attire, and travel accessories during summer is so pronounced it was published by the journal International of E-Commerce Research in 2022. On the other hand, winter apparel, holiday decor, and gifts see a huge boost in sales in winter. Such behaviors are influenced by cultural values, climate and lifestyle changes.

Ecommerce marketing may benefit from the seasons and holidays, but it can also be a double-edged sword. As Brown et al. (2021) indicate, businesses need to manage the supply and demand balance during busy times, which makes stock control important. Stocking inaccurately may lead to lost sales, missed units and unsold units which will need to be written off at a later stage.

There are, however, different impacts in different countries. Jones and Patel (2020) argue that there is substantial cultural and geographical influence on buying behavior. For example, in China, November 11 is celebrated as Singles' Day and is now the highest spending day in the world, surpassing the sales of Black Friday. This event demonstrates the changing dynamics of e-commerce and the impact of culture and regional preferences, Wang et al. (2023) hypothesize.

In a nutshell, modern research suggests that e-commerce activity is heavily impacted by certain periods of the year which, in themselves, bring both prospect and challenge to the companies. These observations allow companies to focus their strategies more effectively, optimize stock levels, and increase customer satisfaction, as stated by Greenfield et al. (2022).

4. Objectives

1. To analyze the Impact of Holidays on E-commerce Sales.

2. To understand Seasonal Variations in Consumer Demand.
3. To evaluate Challenges Faced by E-commerce Businesses.

5. Methodology

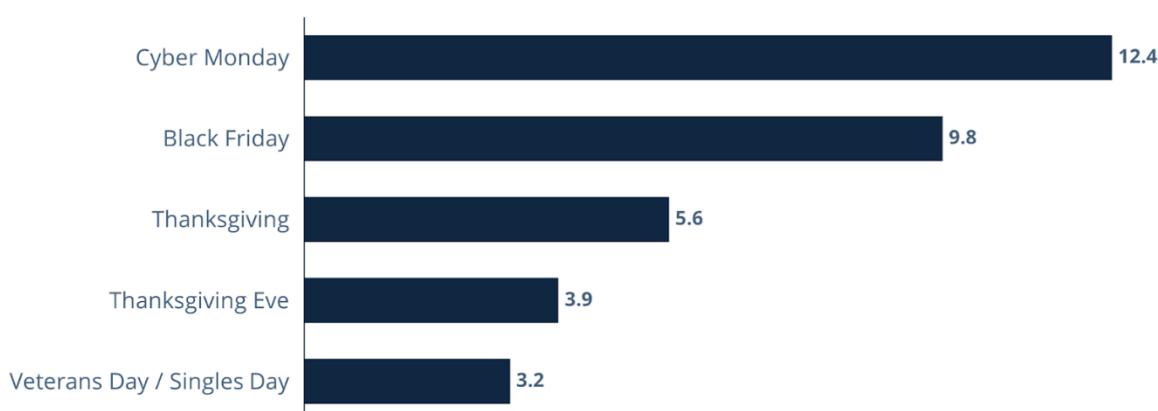
The analysis was conducted using previously gathered information for diverse sources, such as academic journals, articles from Journal of Retail Economics, and International Journal of E-Commerce Research, which provided data regarding the world of e-commerce, seasonal changes, and shopping trends. Besides, industry reports from well-known institutions such as Adobe Analytics, Statista, and McKinsey were also analyzed because they contain important information regarding sales during the important days of Black Friday, Cyber Monday, and Singles' Day. Moreover, provided information from emphasized e-commerce platforms, including Amazon, Alibaba, and Shopify, were examined to determine sales patterns and performance during holiday seasons and other notable changes. When analyzing online spending habits, data given by trade and governmental institutions, such as the National Retail Federation, helped inform predictions about spending during holidays.

6. Factors Influencing Seasonal E-commerce Trends

Holidays: A holiday makes a significant impact in the world of e-commerce, and out of all campaigns launched, holiday marketing campaigns are some of the most effective. Ever since the e-commerce industry has been booming, a huge number of retailers have been known to sell popular items during holidays like Black Friday or Christmas at astonishing discounts of 50% or more. Such actions compel consumers to purchase items that they wouldn't consider buying, which boosts sales, according to research by Smith et al. (2019). Additionally, businesses employ targeted marketing techniques, such as social media advertisements and email newsletters, to generate urgency and excitement, urging customers to buy before the deals expire (Lee, 2020).

ONLINE NET SALES GENERATED DURING THE HOLIDAY SEASON IN THE UNITED STATES BY SHOPPING EVENT, 2023

in billion US\$



Notes: Adobe Analytics analyzed 1 trillion visits to retail sites and over 100 million SKUs in the United States.
 Sources: Adobe Digital Insights.

ECDB

Source: Adobe Digital Insights

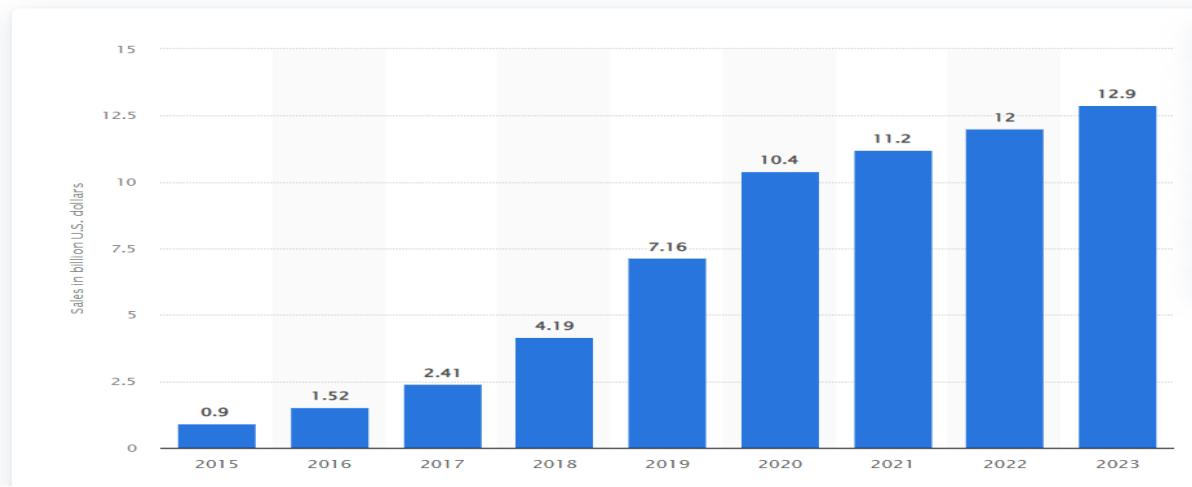
Seasonal Demand: The demand for various items, as well as how consumers act, changes during different periods of the year. For example, people tend to buy home appliances, holiday gifts, and warm clothing during winter months, as well as outdoor equipment, swimsuits, and vacations during the summer. According to a paper published in the International Journal of E-Commerce Research in 2022, weather-related variations in consumer preferences cause demand for particular product categories to peak at particular times of the year. For example, e-commerce sales of summer apparel and accessories rise in the summer, while demand for coats, jackets, and heaters rises in the winter.

Cultural Variations: Different places, different traditions, different cultures have different shopping behavior. For example, while Singles' Day (November 11) is China's biggest online shopping day, Cyber Monday and Black Friday are major shopping days in the United States. According to research by Wang et al. (2023), these cultural variations have an effect on sales in various regions of the world. For example, businesses such as Alibaba claim record-breaking revenues on Singles' Day, which are fuelled by the event's popularity and distinctive Chinese customs. E-commerce is also impacted by other regional festivals, like Christmas in the UK or Diwali in India, when people purchase presents or décor for their homes.

A few factors affect seasonal trends in e-commerce. Consumer needs vary by holiday and promotion, by seasonality and consumer culture, and by region, influencing shopping and affecting what products are selling through online sales. For businesses, knowing these factors is a guide to create your marketing and selling plan accordingly to the market.

7. Case Studies or Examples

Global Amazon Prime Day sales from 2015 to 2023 (in billion U.S. dollars)



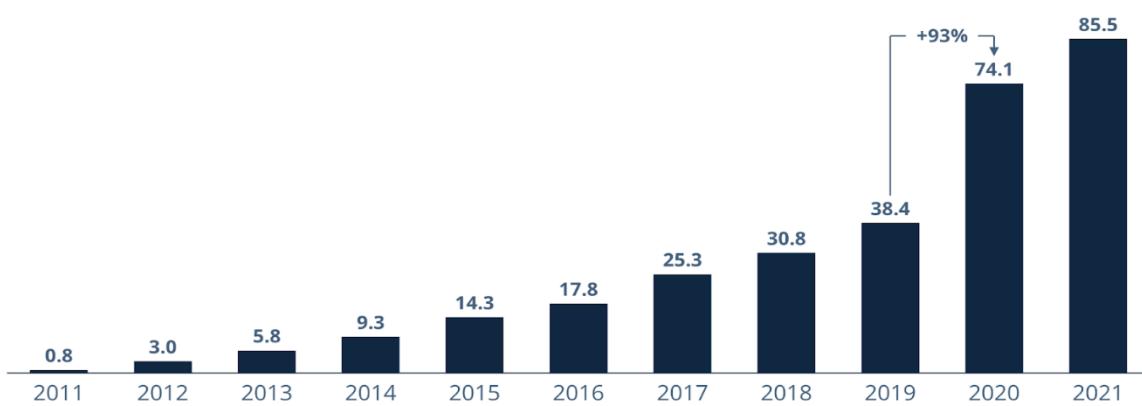
Source: Statista

Successful Seasonal Campaigns:

Amazon has implemented a seasonal marketing campaign that has been widely accepted as successful. Amazon's Prime Day has grown tremendously in popularity and completion. The \$11 billion sales revenue from 2021 exemplifies this. By offering targeted discounts and limited time offerings, excitement can be successfully created surrounding the event. This works because the brand has employed targeted marketing effectively. Alibaba's Single's Day celebrated in China broke records with \$84.5 billion in sales in 2021. Just like Prime Day, heavy advertising coupled with competitive pricing during the event was the key. All these factors act as a positive stimulus for the shoppers encouraging them to act quickly.

ALIBABA'S GROSS MERCHANDISE VOLUME ON SINGLES' DAY, 2011-2021

in billion US\$



Sources: Alibaba

ECDB

Sources: Alibaba, ECDB

Sales Performance During Peak Seasons vs. Off-Peak Periods:

There is a clear variation between sales during top shopping events and lower activity periods. For example, U.S. consumption during the 2020 holiday season increased compared to prior years. As stated by McKinsey (2020), "payer accounts that purchased through U.S. e-commerce stores reached" \$188 billion. At the same time, numbers for off peak

periods like spring and summer were substantially lower. This demonstrates how sales increase during holiday seasons and special events creation, while decreasing in between these periods. To counter these trends, many businesses try to create new promotions during the off-peak season as a way to improve sales.

Analyzing Data from Major E-commerce Platforms:

Sales throughout the year is influenced by seasonal trends as shown from data pulled by popular sites such as Amazon or Shopify. Both Amazon purchases and traffic peaks on Black Friday and Cyber Monday. The top three highest selling items are highly demanded toys, clothes, and gadgets (Amazon, 2021). Also, according to Shopify data, there is a peak in sales for retailers' products during certain times of the year. During the Christmas season in 2020, revenue almost doubled compared to off-season months. To satisfy the customers that expect free shipping, special deals, and seasonal goods, Shopify sellers take advantage of these trends (Shopify, 2021).

In the end, traditional case studies show how ecommerce businesses, especially during specific holidays, can improve their revenue significantly with seasonal promotion campaigns. The importance of marketing techniques and timing can be analyzed comparing the sales in high season and low season. Based on this knowledge, businesses can plan more successful promotional campaigns and target sales to specific long periods of time.



Source: Statista@2023

8. Challenges in Leveraging Seasonal Trends

Inventory and Supply Chain Management Issues:

Businesses often struggle to manage inventory. E-commerce companies, for example, usually face high order traffic during the hectic holiday season which causes serious strain on their previously set inventory management systems. Clients might get disappointed and sales could be negatively impacted if proper stock filters are not put in place. Conversely, companies can find themselves on the losing end as well where excessive stock can lead to markdowns, unsold goods, and loss. According to Jones (2020), it's clear to see many organizations lack sufficient inventory control, leaving them unable to fulfill the demand or bottlenecked with excessive unsold goods.

Risk of Overstocking or Understocking:

Understocking garners a whole new range of issues, one being the necessity to order more goods than required leading to stockouts. This gives rise to financial loss, especially on seasonal inventory where the goods lose value during the off peak months. For example, cold weather jackets waste away when unsold resulting in inflating prices through heavy markdowns to retrieve profits. Sales are lost as a result of customers not being able to receive what they desire. Lost sales occur when customers fail to get what they are looking for. Due to the fact that during peak seasons some businesses are unable to

strike the right level of inventory management, they may either lose money or alienate their customers as pointed out by Smith & Clark (2021).

Competition and Pricing Pressures During Peak Times:

The business world is a very competitive market especially during busy periods such as Cyber Monday and Black Friday. It is very difficult to create a unique marketing strategy when everybody is offering discounts and promotions. Pricing pressures may result, which will force companies to lower their prices in order to remain competitive and hence, cutting their profit margins. As reported by MarketWatch in the year 2020, many shops had to cut their prices dramatically during the 2020 holiday season in order to compete and this was detrimental to their earnings. Fewer customers may be a problem for businesses if they are not properly leveraged, but they also mean that the business can sell each customer less expensive goods, which is not always a positive. This means that businesses have to spend a lot of money on advertising and marketing to make sure that the right people are reached by their advertisements during the time of competition. Therefore, there are some disadvantages of seasonal fluctuations in sales, and they are: Although seasonal fluctuations in sales can increase sales, they are not without their problems. Controlling inventory, determining the right level of inventory, and dealing with high competition and pressure on prices are critical and must be done properly even during peak seasons. Preventing these from happening can greatly help improve the chances of enhancing customer satisfaction and profitability for a company.

9. Strategies for E-commerce Businesses



Source: Decipher zone

E-commerce sales are greatly affected by seasonal changes. There are some times of the year that people buy more of certain products, e.g., festivals and holidays or even change in the weather. For example, winter increases the sales of heaters and woolen clothing, whereas summer increases the demand for air conditioners and swimmingwear. Sales may surge during the Black Friday or Diwali buying seasons, for example, and drop after buying stops. E-commerce companies require astute tactics to capitalise on these patterns and prevent losses during sluggish seasons.

1. Market Analysis – Knowing Customer Needs in Advance

Understanding customer shopping habits helps businesses stay ahead.

Example: The Christmas period is also a time when people look for gifts, decorations and even winter wear while the back to school season also sees a high demand for school bags and other related educational materials and supplies.

Strategy: Businesses should stock up on trending products before the season starts and promote them at the right time.

2. Using Technology to Predict & Manage Sales

Leveraging Artificial Intelligence (AI) and data analytics helps in forecasting demand.

Example: AI can suggest winter collections to customers to store owners as soon as winter sets in.

Strategy: This makes sure companies provide the right products, and reduce waste.

3. Personalizing the Shopping Experience

Customizing offers to customers' preferences boosts engagement.

Example: If someone purchased gym equipment this January, as part of a resolution about fitness, down the line businesses can follow up with discounts on protein supplements or workout gear.

Strategy: Targeted promotions both keep customers engaged and increased off-season sales.

4. Mobile-Friendly Shopping for Convenience

Another reason why a seamless shopping experience on mobile creates more sales.

Example: E-commerce giants Amazon and Flipkart run flash sales that provide app-exclusive deals leading to impulsive buys.

Strategy: Sales can be driven throughout by creating an easy-to-use app and enabling easy payments.

A regression analysis

General Linear Regression Formula:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \epsilon$$

Y = Dependent variable (e.g., e-commerce sales)

- X_1, X_2, \dots, X_n = Independent variables (e.g., holiday periods like Black Friday, Christmas, seasonal shifts like summer, etc.)
- β_0 = Intercept (baseline value of sales when all predictors are zero)
- $\beta_1, \beta_2, \dots, \beta_n$ = Coefficients that show how each independent variable impacts sales
- ϵ = Error term (represents the noise in the data)

For this specific case, the independent variables could include:

- X_1 = Binary variable representing the presence of holidays (Black Friday, Cyber Monday, Christmas)
- X_2 = Seasonal variable (e.g., Summer, Winter, etc.)
- X_3 = Other factors like pricing, stock management, etc. (if available)

This econometric regression model aims to predict e-commerce sales. Here, the coefficients in the model described above encode the propensities of how much sales should increase with an increase in these respective variables. Dependency of each variable shows how elastic or inelastic each variable is with respect to sales. If for example Black Friday sales had the biggest elasticity coefficient, then this means they are the biggest contributor to the overall sales.

10. Conclusion

There is not doubt as to whether or not seasonal trends affect e-commerce sales as such an issue can easily be affirmed. This is because people's buying behavior is likely to change during the year as well as during specific days of the year for instance Christmas and Black Friday. This is in agreement with the notion that those companies that try to understand and prepare for these trends have a higher likelihood of success. Some of the ways e-commerce companies can make the most of these periods of high demand include; through proper planning, personalization and the use of data-driven strategies. But things aren't always easy. It can also be noted that a seasonal campaign may be successful or unsuccessful based on factors like pricing, competition and inventory management. Further, there may be a great deal of competition, especially during the holidays. Nevertheless, it is the companies that will be able to overcome these challenges that will succeed. 2. Future Research Questions: There is still much to learn in the future. More research may be directed towards how cultural differences affect e-commerce seasonal patterns or how new technologies such as artificial intelligence and machine learning will change our ability to forecast and react to changes in sales during different seasons. Companies will have to be very adaptable and always learn from their achievements and failures as e-commerce continues to evolve. Therefore, companies should be ready and prepared to capture seasonal trends even though they are a powerful force. Those who will be able to invent and stay on the pulse of these trends will be the one leading the way in e-commerce in the future.

References

1. Yang, H., Gupta, P., Fernández Galán, R., Bu, D., & Jia, D. (2021). Seasonal Relevance in E-Commerce Search. *Proceedings of the 30th ACM International Conference on Information & Knowledge Management*. <https://doi.org/10.1145/3459637.3481951>
2. Anthony Tapiwa Mazikana. (2023). The Impact of Inventory Management on the Overall Performance of the Organization. A Case of Halsted Builders Express. *Social Science Research Network*. <https://doi.org/10.2139/ssrn.4390856>
3. Bartash, J. (2024, November 15). *Retail sales climb again ahead of holiday shopping season. U.S. economy still has momentum*. MarketWatch. <https://www.marketwatch.com/story/retail-sales-climb-again-ahead-of-holiday-shopping-season-u-s-economy-still-has-momentum-fcea81a4>
4. Bhatt, V., & Nagvadia, J. (2021). *-FACTORS INFLUENCING CONSUMER'S ONLINE BUYING BEHAVIOR: AN EMPIRICAL STUDY*. Doctor of Philosophy in Management. ResearchGate; unknown. https://www.researchgate.net/publication/355396679_-FACTORS_INFLUENCING_CONSUMER
5. Blessing, M. (2024, September 27). *The Insights for Seasonal E-commerce Growth with Google Trends Data*. https://www.researchgate.net/publication/384442270_The_Insights_for_Seasonal_E-commerce_Growth_with_Google_Trends_Data
6. Charm, T., & Ruwadi, B. (2020, November 20). *Holiday shopping in 2020*. McKinsey & Company. <https://www.mckinsey.com/industries/retail/our-insights/holiday-shopping-in-2020>

7. *China's Singles Day 2023: Win the Head and the Heart with Value and Entertainment.* (2023, November 7). Bain. <https://www.bain.com/insights/chinas-singles-day-2023-win-the-head-and-the-heart-with-value-and-entertainment/>
8. Coppola, D. (2023, August 29). *Amazon Prime Day sales 2019.* Statista. <https://www.statista.com/statistics/728120/annual-amazon-prime-day-sales/>
9. *Ecommerce Seasonality 101.* (n.d.). [Www.salsify.com. https://www.salsify.com/blog/ecommerce-seasonality-101](https://www.salsify.com/blog/ecommerce-seasonality-101)
10. *Is Your E-Commerce Platform Ready for Peak Season Traffic? - Webuters.* (2024). [Webuters.com. https://www.webuters.com/can-your-ecommerce-platform-handle-peak-season-traffic](https://www.webuters.com/can-your-ecommerce-platform-handle-peak-season-traffic)
11. Kim, W. B., Xie, J., & Choo, H. J. (2023). Role of perceived benefits of online shopping festival in vietnam: Differences between millennials and generation Z. *Journal of Retailing and Consumer Services*, 75, 103530. <https://doi.org/10.1016/j.jretconser.2023.103530>
12. Nehra, M. (2024, July 9). *Predictions of Top 8 eCommerce Trends in 2025.* Decipher Zone. <https://www.decipherzone.com/blog-detail/ecommerce-trends>
13. Pollák, F., Konečný, M., & Šćeułovs, D. (2021). Innovations in the Management of E-Commerce: Analysis of Customer Interactions during the COVID-19 Pandemic. *Sustainability*, 13(14), 7986. <https://doi.org/10.3390/su13147986>
14. Precedence Research. (2023). *E-commerce Market Size, Trends, Growth, Report By 2032.* [Www.precedenceresearch.com. https://www.precedenceresearch.com/e-commerce-market](https://www.precedenceresearch.com/e-commerce-market)
15. Simpson, L., Taylor, L., O'rourke, K., Shaw, K., & Analysis, A. (2011). *Consumer Behavior on Black Friday.* https://thekeep.eiu.edu/cgi/viewcontent.cgi?article=1012&context=fcs_fac
16. *Singles' Day 2023: Alibaba and JD.com Remain Unspecific | ECDB.com.* (n.d.). [Ecommerceedb.com. https://ecommerceedb.com/insights/singles-day-2023-stagnant-growth-or-surprising-sales-surge/4693](https://ecommerceedb.com/insights/singles-day-2023-stagnant-growth-or-surprising-sales-surge/4693)