Burlington's E-Commerce Problem

Pankhuri Singhal

University of Washington Bothell

Major: Applied Computing

Winter 2021

Contents

Introduction

Problem

Burlington's online shopping site has been experiencing low revenue for some time, to the extent that the CEO is considering shutting down the platform completely. This is contrary to other retailers, who see e-commerce as an economic advantage due to the pandemic forcing people to stay at home and shop online. The reason for low revenue on Burlington's site comes in two parts: fewer people are visiting the site, and less are buying products online.

The CEO, Michael O'Sullivan, has mentioned that the costs of e-commerce are very high; he has said that shipping and merchandising costs would not be accounted for if stores were in-person. This is true, but these costs would be offset by maintaining an online shop during a pandemic, where most people shop online because of safety reasons.

In addition, price and quantity demanded have an inverse relationship—more people are willing to pay at a lower price, and vice versa. Amazon's shipping costs for 2020 totaled $61.1 billion, but the sales from online stores were $236.28 billion, greatly offsetting shipping costs (Coppola). This is due to their efficiency and specialization, and due to the locations of their warehouses. With Burlington adhering to an in-person approach, the combination of the pandemic and shutting down e-commerce could mean that Burlington could go out of business soon.

This nearly happened with Macy's, where revenue fell by 6.1% in Quarter 3 of 2017 (Egan). Former CEO Terry Lundgren was "under the impression that shoppers prefer to shop in the bricks and mortar stores", despite being presented with an offer to advertise their store on a cable channel. After Macy's refused the offer, QVC took advantage of the idea of consumer convenience, and advertised their store on cable; it is now a prominent competitor to Macy's (Aaslaid). Despite the lack of a pandemic in 2017, Macy's failure to innovate by at least advertising their company on cable channels correlated with the drop in sales for eleven straight quarters.

If a company like Macy's did not innovate and suffered a drop in sales for just under three years as a result, then Burlington's decision to shut down its e-commerce efforts during a pandemic could mean it going under in the near future.

Solution

As a solution to the low revenue problem, Burlington should relaunch their website and harness the power of Cloud computing to manage the costs of an e-commerce platform. Using Cloud's AI features, Burlington needs to target advertising so that it can increase the number of visitors on the site. Additionally, if Burlington leverages Cloud's AI, then it could set optimal prices on items; this can motivate buyers to buy products, increasing revenue and profit for the company.

Burlington needs to relaunch and redesign its e-Commerce platform with the help of Cloud's AI services to implement competitive pricing to attract customers, and to stock items that match users' demographics. This will help the company generate more revenue from its site.

Explanation of Terms

This section will discuss some relevant features of the Cloud, such as various Cloud strategies and Cloud solutions. The terms are defined in Table 1.

Table 1: Explanation of Terms

Term	Definition
IaaS (Infrastructure-as-a-Service)	A service of Cloud in which the user has access to several Cloud tools. The Cloud Service Provider (CSP) *manages the infrastructure itself*, and the client manages the OS and applications they host. It is an easy alternative to a business looking to migrate from on-premises hardware and datacenters to Cloud's virtual servers (Hou). It uses a pay-as-you-go model, where the client will only pay what they need and not have upfront expenditures on physical hardware.
PaaS (Platform-as-a-Service)	A service provided by Cloud that, in addition to IaaS coverage, allows the CSP to *manage the database and OS*. This allows PaaS solutions to run on either Windows or Linux OS. With this service, the CSP manages the OS and database, making the client's application more cost-effective since they do not need to purchase and manage the software themselves (Jamsa).
SaaS (Software-as-a-Service)	A Cloud service model that requires that the CSP manage *all aspects of the solution*, hardware and software. Like PaaS, the CSP manages the OS, making this service model run on Windows and Linux OS; unlike PaaS, the CSP also manages the applications hosted (Microsoft). An example of a SaaS solution is Microsoft OneDrive, where the client can store files on an app that runs in the Cloud.
Hyperscale Computing	A hyperscale architecture is an architecture that's able to expand or contract based on shifting demands. Hyperscale computing is used in cloud computing, and its primary purpose is to help a client leverage the Cloud's flexibility. In business apps such as e-commerce, hyperscale computing can be used for reducing complexity with online users ("data traffic"), and its scalability makes it a viable candidate for meeting the changing seasonal demands of online shoppers (Bhagchandani).
Artificial Intelligence/Predictive Algorithms	The Cloud has several AI features that can improve search results to match a user's favored items. For example, Etsy is using Google Cloud's AI features to analyze its consumers' behaviors, and move the most relevant results or products to the first page after typing in a search term (Castellanos).
Inventory	any property/item that's held by a company; for this paper, inventory will be defined only as the finished goods ready to be sold
Unplanned inventory investment	The difference between predicted sales and actual sales; can be positive or negative depending on whether sales are less or more (respectively)

Term	Definition
E-commerce conversion rate	the ratio of consumers who visit a website to consumers who buy from the website

A summary of each Cloud service and its coverage is shown in Figure 1.

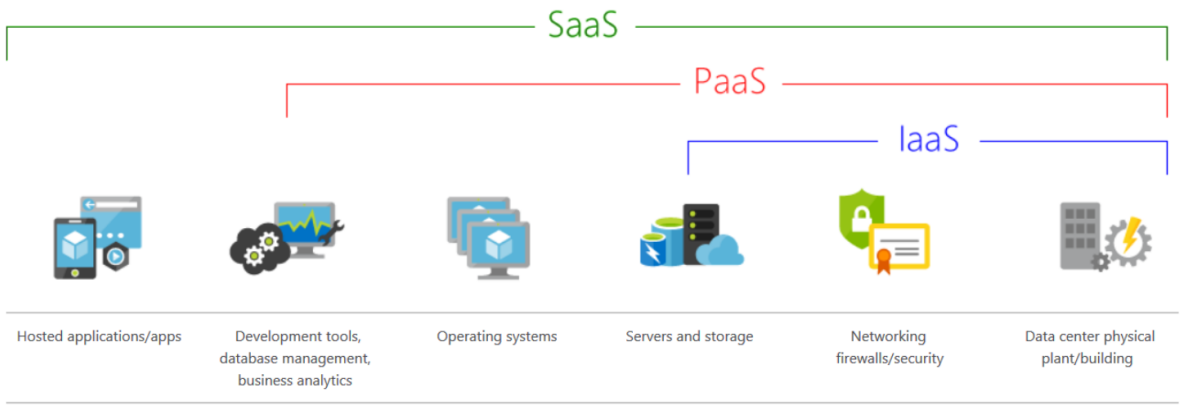

Figure 1: Illustration of Services separated by Cloud Service Models. Source: Microsoft.

What Burlington Needs for a Successful E-commerce Platform

Burlington needs to generate more revenue while minimizing the costs of e-commerce. They also need to attract more customers with competitive pricing and stock products at the right locations. Based on this, Burlington needs several key features to run a successful e-commerce platform that generates the right demand curves and allows for more customers to shop online.

High Compute Power

Since Burlington will receive many customers on their shopping site due to the pandemic, and big sales events tend to cause a large influx of customers, an e-commerce platform will need high compute power to reduce the latency of their site. In an age of convenience, many online shoppers will cite latency or site slowness as the reason to abandon a purchase.

AI

AI can help Burlington address the demands of its consumers more, by predicting future demand and anticipating what inventory, or products, to stock. Through this, the increased efficiency of the company can reduce costs (BBVA). AI algorithms can also help with sales forecasts.

As an example, suppose Burlington wants to do a sales event, and they expect 50,000 units to be sold; therefore, they buy and stock 50,000 units. However, if only 40,000 units are sold, then there is an unplanned inventory of 10,000 units, which means that Burlington has overpurchased. This leads to wasted costs of however much those extra 10,000 units were priced at—called unplanned inventory investment. AI can help minimize this wasted cost by looking at historical sales and deriving patterns to see how many units will actually be sold in the future.

Choosing the Right Cloud Service

For Burlington to run a successful e-commerce platform on the Cloud, they need to choose the right platform to run on. Mr. O'Sullivan, the CEO, mentioned that shipping and merchandising costs would be too high for an e-commerce platform to be successful, so the Cloud solution needs to be as cost-effective as possible; this means that Burlington must manage as little Cloud capabilities by itself as it can. Most Cloud capabilities will need to managed by a third party, the CSP.

Considering Burlington's primary goal is to generate revenue, Burlington needs to make sure that its online store can effectively gather search data and predict what customers want from the store. This can be accomplished with Cloud's AI features, but this needs high compute power. Table 2 weighs IaaS, PaaS, and SaaS against the criteria of compute power and AI capabilities.

Table 2: Comparison of IaaS, PaaS, and SaaS

Criterion	IaaS [1]	PaaS [2]	SaaS [3]
Compute power	Yes, IaaS has option of limitless compute power	Same as IaaS compute power	Same as IaaS compute power
AI capabilities	No; provided by client since IaaS doesn't support business analytics	Yes, AI solutions provided by CSP, as PaaS supports analytics and data management	Same as PaaS AI capabilities

Sources:
[1] "IaaS (Infrastructure-as-a-Service)." IBM Cloud Learn Hub. 12 July 2019. Web. 04 Mar. 2021.
[2] Bui, An. "The Big Data Stack: Powering Data Lakes, Data Warehouses And Beyond." Panoply. 12 Jun. 2018. Web. 04 Mar. 2021.
[3] "Big data as a service (BDaaS) solutions: comparing IaaS, PaaS and SaaS." Packt. 28 Aug. 2018. Web. 04 Mar. 2021.

Based on this table and Burlington's need for a cost-efficient e-commerce site, Burlington should choose SaaS as their cloud service upon which to launch their site.

Post-Site Launch: AI to Improve E-commerce Success Factors

Once Burlington launches their site, the next step is to maximize revenue from it.

Even before the pandemic, Burlington's 10-K Report (a report about its financial performance) noted that "Merchandise sold directly from our website represented approximately 0.5% of our total sales in Fiscal 2019" (Burlington Stores, Inc.). This statistic represents the "e-commerce conversion", which is the ratio of online shoppers visiting the website to actually buying from the website. The average conversion rate was around 2.57% in 2019 (Saleh).

To improve Burlington's conversion rate, the store needs to do two things: increase the number of users visiting the store; and increase the number of visitors buying online. AI can help improve both of these through dynamic sales predictions, optimal pricing, and accurate inventory management.

Improving the Sales Predictions

Sales predictions or sales forecast is a prediction of a store's future sales revenue, based on past revenue data. An example forecast based on past data is shown in Figure 2, where the blue line indicates actual revenue and the red area is the estimated revenue. Since the actual data went only up to the end of 2017, the blue line does not account for the 2020 pandemic; however, the shaded red area shows that the estimated revenue can go both ways up or down the x-axis.

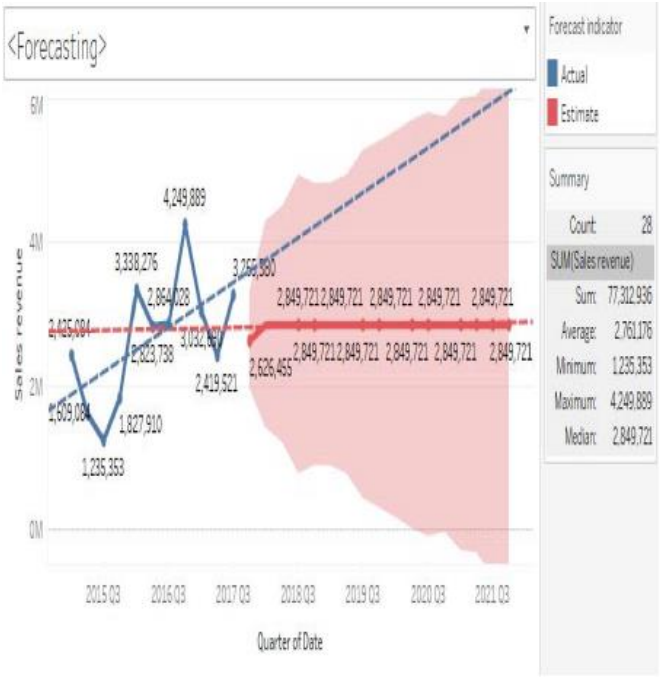

Figure 2: Example forecast for five years. Source: Cheriyan, et al. (2018).

A study conducted by the Higher College of Technology in Oman compared three machine learning algorithms and examined each one's accuracy in predicting future sales for an e-fashion store. The three algorithms chosen were: Generalized Linear Model (GLM), Decision Tree, and Gradient Boost Tree (GBT). The results showed that the GBT algorithm (which combined many decision trees to get a final tree) was 98% accurate in predicting future sales for the store, based on past sales data (Cheriyan, Ibrahim and Mohanan).

Burlington should use the GBT model when forecasting their sales; it's beneficial as the study tested out these three algorithms on an e-fashion site, in a similar industry. With the GBT model, Burlington could predict the revenue generated from their site every quarter.

Setting Optimal Prices

Price optimization can set stores up for understanding consumer habits and maximizing revenue and profit. Additionally, in the long term, it will also maintain consistency of prices. For example, if Burlington sees that its everyday prices are too low (and the resulting revenue doesn't cover costs), then even a gradual price increase will be noticed by consumers and reduce their willingness to pay. The goal here for Burlington is to decide what price point to operate at to maximize the revenue and profit. However, consumer behavior changes rapidly. Having automated AI software to decide dynamic prices will return time lost by human price analysts.

The software will collect price-related data, such as purchase history, product demand, and competitors' pricing and inventory. The AI will normally use regression models to identify patterns and predict prices based on this data (Kumar).

Improving Inventory Management

As stated in the example in the section "AI", retail stores often might have an unplanned inventory investment, where the units stocked doesn't equal the units sold. This can lead to wasted costs (if there are units left over), or lower sales (if units are sold too quickly). Respectively, this is positive unplanned inventory and negative unplanned inventory (Krugman). So, for Burlington to run smoothly, the unplanned inventory should be 0, or as close to 0 as possible.

Cloud's AI features can help Burlington manage its inventory through Reinforcement Learning systems. This is where the software acts upon the inventory predictions it makes, and then the software is "rewarded" or "punished" based on whether the inventory was handled well or not. The platform Remi AI benefited from this technique, where one implementation led to a 32% reduction in costs (Remi AI).

Conclusion

Burlington's e-commerce site can utilize Cloud's AI tools to improve their e-commerce platform after launch—these tools can set fluctuating prices, provide analysis on inventory, and create sales forecasts to maximize their revenue. In the ongoing pandemic that brought about a boom in e-commerce, Burlington could migrate to the Cloud, and by using the AI services, could restart and reinvent their company.

Bibliography

Aaslaid, Katrina. *50 Examples of Corporations That Failed to Innovate*. Valuer, 2019. E-book.

BBVA. "How artificial intelligence gives ecommerce a boost." 11 August 2020. *BBVA.* Web. 6 March 2021.

Bhagchandani, Varsha. "Hyperscale Computing: The Next Big Thing?" 11 September 2018. *Equinix Interconnections.* Web. 2 March 2021.

"Big data as a service (BDaaS) solutions: comparing IaaS, PaaS and SaaS." 28 August 2018. *Packt.* Web. 4 March 2021.

Bui, An. "The Big Data Stack: Powering Data Lakes, Data Warehouses And Beyond." 12 June 2018. *Panoply.* Web. 4 March 2021.

Burlington Stores, Inc. "Form 10-K For the Fiscal Year Ended February 1, 2020." SEC Filing. 2020. Web.

Castellanos, Sara. "Etsy Taps Google Cloud to Improve Search, Juicing Sales." *Wall Street Journal* 13 May 2019. Web.

Chang, Chloe. "3 ways AI can help solve inventory management challenges." 4 March 2020. *IBM Supply Chain Blog.* Web. 6 March 2021.

Cheriyan, Sunitha, et al. "Intelligent Sales Prediction Using Machine Learning Techniques." Conference Paper. 2018. Document.

Coppola, Daniela. "Net revenue of Amazon from 2006-2020, by segment." *Key Figures of E-Commerce*. Statista, 11 February 2021. Web.

Duprey, Rich. "Is Burlington Stores Crazy for Eliminating Its E-Commerce Platform?" 14 March 2020. *The Motley Fool.* Web. 20 February 2021.

Egan, Matt. "Macy's is stuck in an epic losing streak: Sales drop for 11th quarter in a row." 9 November 2017. *CNN Business.* Web. 6 March 2021.

Farooqui, Salmaan. "E-commerce boom fuels shifts in job trends: Cloud computing, AI, security among roles likely to see high demand." *Toronto Star* 25 January 2021. Web.

Garcia, Tonya. "Burlington Stores is shutting down its e-commerce site to focus on bricks-and-mortar stores." 9 March 2020. *MarketWatch.* Web. 17 February 2021.

Google. "Features and capabilities of Recommendations AI." 9 February 2021. *Google Cloud.* Web. 17 February 2021.

Hou, Tony. "IaaS vs PaaS vs SaaS Enter the Ecommerce Vernacular: What You Need to Know, Examples & More." n.d. *BigCommerce.* Web. 27 February 2021.

IBM Cloud Education. "IaaS (Infrastructure-as-a-Service)." 12 July 2019. *IBM.* Web. 4 March 2021.

Jamsa, Kris. "Platform as a Service (PaaS)." *Cloud computing : SaaS, PaaS, IaaS, virtualization, business models, mobile, security, and more*. Burlington, MA: Jones and Bartlett Learning, 2013. Web.

Krugman, Paul. "Inventories and Unplanned Investment Spending." Krugman, Paul. *Macroeconomics*. New York City: Worth Publishers, 2018. 326. Print.

Kumar, Arun. "Price Prediction using Machine Learning Regression — a case study." 30 March 2020. *Towards Data Science.* Web. 8 march 2021.

Microsoft. "What is cloud computing?" n.d. *Introduction to Azure Fundamentals.* Web. 27 February 2021.

Nguyen, Andrew. "E-commerce Sales Reporting: ERR Diagram, SQL Processing and Data Studio Dashboard." 23 August 2020. *Towards Data Science.* Web. 4 March 2021.

Remi AI. "Artificial Intelligence for Inventory Management." 3 July 2018. *Medium.* Web. 9 March 2021.

Saleh, Khalid. "Chapter 5: The Average Website Conversion Rate by Industry (Updated by 2020)." n.d. *Invesp.* Web. 6 March 2021.

Tanenbaum, Andrew S and Herbert Bos. "7.11.1 Clouds as a Service." Tanenbaum, Andrew S. *Modern Operating Systems*. New Jersey: Pearson Education Inc., 2015. 496. E-Book.

Zanoon, Nabeel, Abdullah Al-Haj and Sufian M Khwaldeh. "Cloud Computing and Big Data is there a Relation between the Two: A Study." *International Journal of Applied Engineering Research* (2017): 6970-6982. Web.