Market Basket Analysis of Electronidex Sales

June 2022

Overview

Electronidex is a small startup tech company offering a modest catalog of 125 items. I have analyzed one month's worth of transaction data to glean insight into the viability of acquiring the company as an extension of Blackwell Electronics. The available data consists of 9835 transactions over a 30 day period, averaging 328 transactions per day. Electronidex's catalog is accessory-heavy (79 of 125 items by my count), but four of their top five best sellers are computers.

The Apple iMac is their number one seller, appearing in over 25% of all transactions (2519 transactions), but their customer base is also heavily Windows-oriented as their number two seller is the HP Laptop, sold in 1909 (19% of) transactions. A substantial 37% of all transactions involve either iMac, HP Laptop, or both. Rounding out the top five sellers are the CYBERPOWER Gamer Desktop (1809 transactions), Apple Earpods (1715), and the Apple MacBook Air (1530).

Item	No. of Instances
iMac	2519
HP Laptop	1909
CYBERPOWER Gamer Desktop	1809
Apple Earpods	1715
Apple Macbook Air	1530
Other Items	33622
TOTAL	43104

Table 1: Total Item Instances in Transactions

Blackwell Electronics has an existing business relationship with both Sony and Acer. While Electronidex does carry three Acer products, it is notable that none of their products are manufactured by Sony. As we know, Blackwell's current customer base prefers Sony to Acer by a margin of 3:2, which was taken into consideration when deciding which of the two companies to expand our relationship with. This fact should not be disregarded when considering whether or not to acquire Electronidex. Also, while they do carry a number of PCs, laptops, and netbooks, Electronidex currently offers no smartphone options, an item that we already know to be in high demand by Blackwell's customers.

Method

To understand customer buying patterns, I performed Market Basket Analysis (MBA) on the transaction history provided by Electronidex. MBA is a strategy of identifying "rules" in purchasing patterns as they are demonstrated in real world data. We attempt to find recurring groups of items that are purchased together in hopes of better understanding what items can be promoted with each other. When we identify that a particular item is frequently purchased with another particular item, we can establish a rule (i.e. *"When customer purchases X, she is likely to also purchase Y"*).

When assessing the results of MBA, we are considering primarily two main metrics: support and confidence. Support can be thought of as the percentage of the total transactions in which the rule is demonstrated (X is purchased and thus so is Y). Confidence is the percentage of instances in which X is purchased that Y is also purchased. Support can be translated into a count of transactions in which the rule is demonstrated by multiplying it by the total number of transactions being analyzed.

Results

I first searched for the best overall rules applicable to the entirety of the data set. Since it was such a dominant item in the sales totals, the vast majority of the strongest rules related to the iMac. I noted the strongest rules by both support and confidence, as well as the ones that seemed to have a good balance between the two metrics.

Next, I excluded all rules that contained iMacs to see if we could find some useful rules for other items. The results were HP Laptop-heavy, since that was now the dominant seller in the data set. I repeated my strategy of rules selection before excluding HP Laptop from the rules set and making a third assessment. On the final pass, I noticed a significant drop in both the average support and confidence of the rules, but was still able to identify some pertinent patterns that occurred at least 25-33% of the transactions involving the relevant items (meaning for every 3-4 purchases of the item, one could expect a customer to also purchase the associated item).

I was able to identify some rules of interest in customer purchasing habits that could prove useful in marketing and placement strategies should Blackwell decide to proceed with the acquisition. They are listed in Table 2 along with their support and confidence metrics.

Recommendations

While Electronidex carries a wide variety of accessories that may be redundant with Blackwell's existing inventory, they have done exceedingly well in laptop/netbook/PC sales, a sector in which Blackwell has historically floundered (as is demonstrated by the data from previous analysis). Furthermore, Electronidex has little overlap in the gaming sector with Blackwell, which is an area in which we have done quite well with our current product lineup. Acquisition of Electronidex could prove quite lucrative in both the short and long term for Blackwell.

Should Blackwell make the decision to proceed with the acquisition, sales could be maximized by using the rules in Table 2 to determine product placement on shelves as well as product recommendations online, or offering discounted bundles to encourage the purchase of multiple items. For instance, we know that many customers who buy iMacs also tend to by Windows machines like HP Laptop or Lenovo Desktop as well. Placing these items near each other on the shelves and even setting up a display that demos the three items together could encourage more sales.

Bundled accessories could also be an easy way to upsell customers. We know when the Acer Aspire and ViewSonic monitor are purchased together, 60% of the time they also purchase an HP Laptop – the current number 2 seller. Perhaps offering a bundled package with the purchase of the HP Laptop that yields the customer a savings on the Acer Aspire and ViewSonic Monitor would move more units.

These are just a couple suggestions, but the possibilities are vast given the depth of rules that can be discovered through Market Basket Analysis.

|			Support	Confidence	Count
Best Overall Rules					
By Support					
{HP Laptop}	=>	{iMac}	7.55%	38.92%	743
{Lenovo Desktop Computer}	=>	{iMac}	5.88%	39.70%	578
{CYBERPOWER Gamer Desktop}	=>	{iMac}	5.67%	30.85%	558
By Confidence					
{Acer Aspire, ViewSonic Monitor}	=>	{HP Laptop}	1.08%	60.23%	106
{ASUS 2 Monitor, Lenovo Desktop Computer}	=>	{iMac}	1.09%	59.12%	107
{Apple Magic Keyboard, Dell Desktop}	=>	{iMac}	1.02%	58.48%	100
Balanced					
{Dell Desktop}	=>	{iMac}	5.46%	40.74%	537
{ViewSonic Monitor}	=>	{iMac}	4.94%	44.79%	486
{Apple Magic Keyboard}	=>	{iMac}	3.23%	45.11%	318
{Microsoft Office Home and Student 2016}	=>	{iMac}	3.10%	46.64%	305
Best Rules Excluding Top Seller (iMac)					
By Support					
{ViewSonic Monitor}	=>	{HP Laptop}	4.80%	43.50%	472
{Lenovo Desktop Computer}	=>	{HP Laptop}	4.62%	31.18%	454
{Dell Desktop}	=>	{HP Laptop}	4.49%	33.54%	442
By Confidence					
{Dell Desktop, ViewSonic Monitor}	=>	{HP Laptop}	1.53%	57.47%	150
{CYBERPOWER Gamer Desktop, ViewSonic Monitor}	=>	{HP Laptop}	1.22%	50.21%	120
{Lenovo Desktop Computer, ViewSonic Monitor}	=>	{HP Laptop}	1.40%	49.46%	138
Balanced					
{Apple Magic Keyboard}	=>	{HP Laptop}	2.89%	40.28%	284
{ASUS Monitor}	=>	{HP Laptop}	2.02%	36.51%	199
{Microsoft Office Home and Student 2016}	=>	{HP Laptop}	2.34%	35.17%	230
{Acer Aspire}	=>	{HP Laptop}	2.91%	35.14%	286
Best Rules Excluding Top 2 Sellers (iMac & HP Laptop)					
By Support					
{Dell Desktop}	=>	{Lenovo Desktop Computer}	3.67%	27.39%	361
{Samsung Monitor}	=>	{CYBERPOWER Gamer Desktop}	3.10%	32.41%	305
{Apple MacBook Pro}	=>	{Apple Earpods}	2.90%	26.22%	285
By Confidence					
{CYBERPOWER Gamer Desktop, Dell Desktop}	=>	{Lenovo Desktop Computer}	1.02%	33.44%	100
{Intel Desktop}	=>	{Lenovo Desktop Computer}	1.32%	33.33%	130
{ASUS Chromebook}	=>	{ViewSonic Monitor}	1.75%	33.33%	172
Balanced					
{ViewSonic Monitor}	=>	{Lenovo Desktop Computer}	2.84%	25.71%	279
{Acer Desktop}	=>	{Dell Desktop}	2.77%	27.15%	272
{Acer Aspire}	=>	{Dell Desktop}	2.37%	28.62%	233
{Apple Magic Keyboard}	=>	{Lenovo Desktop Computer}	2.21%	30.78%	217

Table 2: Rules from Market Basket Analysis
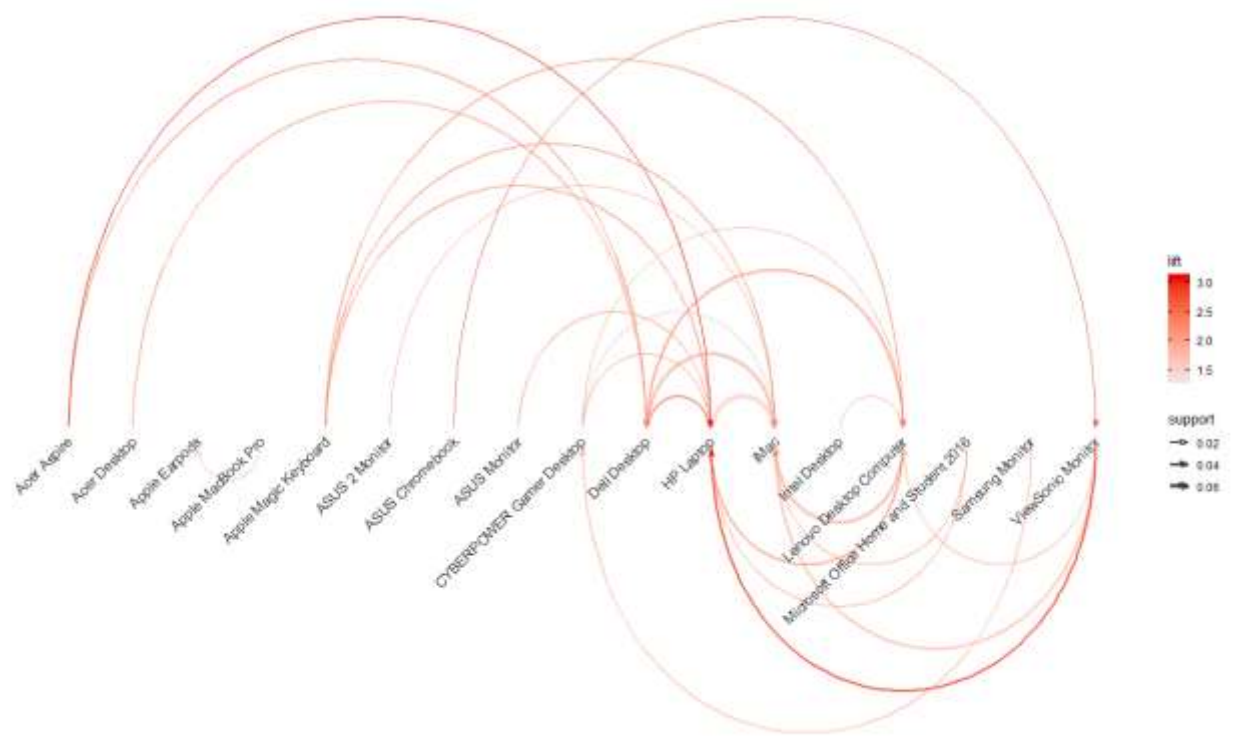
Figure 1: Item Association in MBA Rules Set