

Market Basket Analysis - Course 3, Task 4

Electronidex Business Investigation

Primary Objective:

- Use a market basket analysis to discover any interesting relationships between the items in customer transactions

Business Question:

- Should Blackwell Electronics acquire Electronidex?
 - Would Blackwell Electronics benefit from selling any of Electronidex's items?
 - What other recommendations would you make for the new combined business?

Data Set

For this analysis and modeling we used a data set containing 30 days of online Electronidex's online transactions. This contains 9835 unique transactions, each containing a subset of 125 items. On average, each transaction contained 4.4 items. The top-20 most purchased items are shown in Figure 1.

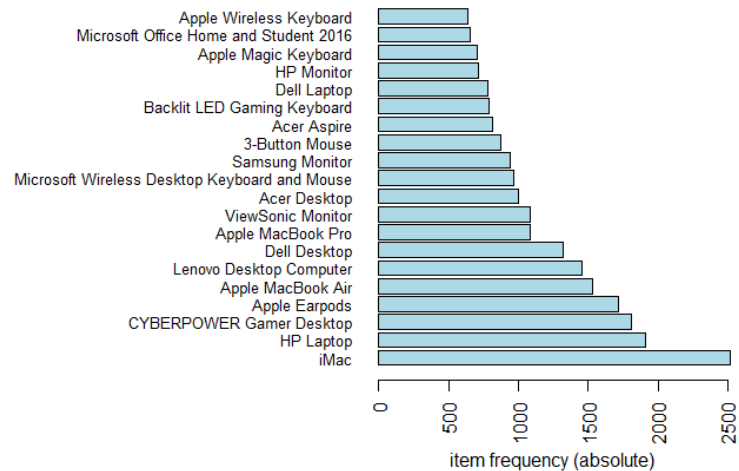


Figure 1: Item frequency for the top-20 items within the 30-day transaction set

Methodology

To establish buying patterns between items, we used the Apriori Algorithm, where we tune support and confidence levels to generate rules. Due to the large number of items (125) relative to the number of

transactions, support had to be reduced to 0.02 to generate a single rule at 50% confidence. With further tuning, a set of meaningful rules were generated with a support minimum of 0.006 and a confidence minimum of 60%. From this, we produced the 17 rules shown in Table 1. These rules are sorted by lift, which is a powerful metric which indicates the strength of the link between the items. The support minimum of 0.006 (as in, a rule occurs in 0.6% of all transactions) generated at least 61 instances of the rule occurring in the data, which feels significant enough for a rule to be important. The support, confidence, and lift of these rules are also plotted in Figure 2.

Table 1: Optimized rules, sorted by Lift

	lhs	rhs	support	confidence	coverage	lift	count
[1]	{Acer Aspire,iMac,ViewSonic Monitor}	=> {HP Laptop}	0.0062	0.663	0.0094	3.416	61
[2]	{Acer Desktop,iMac,ViewSonic Monitor}	=> {HP Laptop}	0.0064	0.636	0.0101	3.278	63
[3]	{Dell Desktop,Lenovo Desktop Computer,ViewSonic Monitor}	=> {HP Laptop}	0.0062	0.622	0.0100	3.207	61
[4]	{Computer Game,ViewSonic Monitor}	=> {HP Laptop}	0.0074	0.619	0.0120	3.187	73
[5]	{Acer Aspire,ViewSonic Monitor}	=> {HP Laptop}	0.0108	0.602	0.0179	3.103	106
[6]	{Dell Desktop,Lenovo Desktop Computer,ViewSonic Monitor}	=> {iMac}	0.0069	0.694	0.0100	2.709	68
[7]	{Apple Magic Keyboard,ASUS Monitor}	=> {iMac}	0.0068	0.670	0.0102	2.616	67
[8]	{Acer Desktop,HP Laptop,ViewSonic Monitor}	=> {iMac}	0.0064	0.656	0.0098	2.562	63
[9]	{Acer Desktop,ASUS 2 Monitor}	=> {iMac}	0.0064	0.643	0.0100	2.510	63
[10]	{ASUS Monitor,ViewSonic Monitor}	=> {iMac}	0.0082	0.638	0.0129	2.490	81
[11]	{ASUS Monitor,Dell Desktop}	=> {iMac}	0.0079	0.634	0.0125	2.476	78
[12]	{Acer Desktop,HP Laptop,Lenovo Desktop Computer}	=> {iMac}	0.0063	0.633	0.0100	2.470	62
[13]	{ASUS Monitor,Lenovo Desktop Computer}	=> {iMac}	0.0098	0.632	0.0155	2.466	96
[14]	{ASUS 2 Monitor,Dell Desktop}	=> {iMac}	0.0090	0.631	0.0143	2.464	89
[15]	{Acer Desktop,Apple Magic Keyboard}	=> {iMac}	0.0067	0.623	0.0108	2.431	66
[16]	{HP Laptop,Lenovo Desktop Computer,ViewSonic Monitor}	=> {iMac}	0.0084	0.601	0.0140	2.348	83
[17]	{Dell Desktop,Microsoft Office Home and Student 2016}	=> {iMac}	0.0095	0.600	0.0158	2.343	93

Observations

Due to the bar set for support level in rule generation, these 17 rules all appear to be insightful. Of note, the right-hand-side (RHS) of the rules are the top two frequency items from Figure 1. As they are present in more transactions than any other items, it makes sense that rules can be generated off of them.

From a business perspective, there are a few important insights from these rules:

- Many of the left-hand-side items are peripherals that are directly linked to buying a new computer. Of these, a monitor is the most prevalent, residing in 14 of our 17 rules. In a similar iteration isolating for Monitors on the RHS, we can generate strong rules (lift >5), but support is limited to ~ 20 examples. However, the overall predictive link between monitors and computers appears strong in both directions.
- A Dell Desktop was included in 5 of these 17 rules with a computer on the RHS. We found this surprising that customers buy more than 1 computer at a time, and further insight of these transactions to investigate the demographics could be useful (Corporate IT department accounts?). This is further supported by rules with and HP laptop on the LHS and an iMac on the RHS. Multiple computer purchases in a single transaction appear quite common, which is unexpected.
- Rules with an HP laptop on the RHS have the highest lifts, indicating their strengths, and should be leveraged in future marketing promotions.

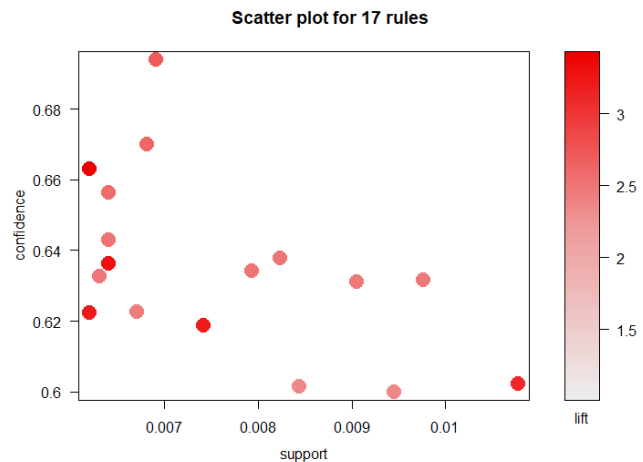


Figure 2: Rule set plotted by confidence, support, and lift

Business Decisions

When comparing the product lines versus the Blackwell Electronics offerings in the prior tasks, the acquisition of Electronidex appears prudent. There are many synergies and Blackwell would likely benefit from Electronidex's customer base. Similarly, the rules generated here, as well as future ones generated post-acquisition once more Electronidex data is available could highlight key items missing from Blackwell's offerings that could drive sales if they were made available. Seamlessly linking the buying process for future customers using the combined Blackwell and Electronidex product sets could yield new, stronger transaction linkages previously unavailable, further driving sales of the combined company. Therefore, we recommend that Blackwell Electronics acquire Electronidex.