Blackwell Electronics

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| To: | Danielle Sherman, CTO, Blackwell Electronics |
| Cc: | E. Logan Crawford |
| From: | Kate Koebbe |
| Date: | 20 January 2022 |
| Re: | Electronidex Market Basket Analysis |

The Blackwell Electronics Data Analytics team was recently tasked with evaluating purchasing patterns among items offered by Electronidex, an online electronics retailer and prospective acquisition for our Board of Directors. Our Board is specifically interested in understanding whether there are associations among items purchased and if there are sales opportunities our company should capitalize on if Blackwell acquires Electronidex.

Chart

Description automatically generatedThe data provided by Electronidex is a 30-day transaction history, consisting of 9,835 transactions. The total number of items sold by Electronidex (125) is represented in the monthly sales volume (i.e. the company sold at least one of each item in its inventory during this month). The most frequently sold items are commonly sold items among most electronics retailers. Sales volume for the top five most frequently sold items are: iMac (n=2519), HP Laptop (n=1909), CYBERPOWER Gamer Laptop (n=1809), Apple Earpods (n=1715), and Apple MacBook Air (n=1530). The graphic at left illustrates the relative frequency of the top 10 items sold by Electronidex. Approximately 62% of transactions contain four items or fewer.

One of the key objectives of our analysis was to determine if there were relationships among sales of particular items; that is, if a customer purchases item ‘y’ (called the *condition*) are they likely to purchase item ‘z’ (the *result*). This type of analysis is called association analysis and relies on a specific algorithm, called the Apriori Algorithm, to determine item associations. Association analysis produces association rules, where the rules demonstrate the individual associations (see our “y 🡪 z” above). We can set specific measures of these rules to determine applicability to our business goals called *support* and *confidence*, where support determines how often a rule is applicable to our data and confidence determines how often items appear in transactions. Rules with both high support and confidence are called *strong rules* and demonstrate a likely association among items.

The highest support and confidence values at which we were able to generate rules with a minimum length of two items was 0.05 and 0.10, respectively. Using these parameters, we were able to generate eight rules, detailed in the table below.

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| Condition | Result | Support | Confidence | Lift |
| Dell Desktop | iMac | 0.05460092 | 0.4074355 | 1.590762 |
| iMac | Dell Desktop | 0.05460092 | 0.2131798 | 1.590762 |
| CYBERPOWER Gamer Desktop | iMac | 0.05673615 | 0.3084577 | 1.204320 |
| iMac | CYBERPOWER Gamer Desktop | 0.05673615 | 0.2215165 | 1.204320 |
| Lenovo Desktop Computer | iMac | 0.05876970 | 0.3969780 | 1.549932 |
| iMac | Lenovo Desktop Computer | 0.05876970 | 0.2294561 | 1.549932 |
| HP Laptop | iMac | 0.07554652 | 0.3892090 | 1.519599 |
| iMac | HP Laptop | 0.07554652 | 0.2949583 | 1.519599 |

The figure on the next page illustrates our transaction rules graphically, where the color density indicates the confidence of the rule. Our strongest rule is that if a customer purchases a Dell Desktop, they will also purchase an iMac. We can infer this from 5% of the transaction data with 40% accuracy. Conversely, 5% of the data demonstrate that if a customer purchases an iMac, they are likely to purchase a Dell Desktop. However, we can only say this with 21% confidence. Given the low support values and low-to-moderate confidence values, our team would not classify these rules as *strong* rules. Therefore, from a business perspective, we’ve determined that this Electronidex data demonstrates very little business value to our company from an association perspective. Our Board may consider requesting additional data when available in the case that other product associations may become apparent. Absent any clear benefit from Electronidex from an item association perspective, the Board may want to consider the types of items sold by Electronidex, whether or not they overlap with our current inventory, and if their sales volume outpaces ours in certain categories.

Chart, line chart

Description automatically generated

Respectfully,

Kate Koebbe

Data Analyst

Blackwell Electronics