

Launching Pet Box Subscriptions

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I. About the Company

PetMind is a pet product retailer since 2017 in the United States. The company sells products such as accessory, bedding, clothes, food, equipment, grooming, housing, medicine, snack, supplements, and toys for dogs, cats, fish, birds, hamsters, and rabbits. Currently, their goal is to reduce the cost of customer retention by improving brand loyalty. For the last decade, the subscription economy has grown by more than 435% (Subscription Economy Index, 2022). Hence, their first approach to this is to launch a monthly pet box subscription within the next 2 months by analyzing historical data of PetMind from last year.

II. Business Task

Preparing a list of popular products for the pet box subscription.

The current objective of **PetMind** is to improve brand loyalty by launching a monthly pet box subscription. Hence, the business task is to narrow down the list of popular products that should be included in the monthly subscription.

In particular, the chief marketing officer, or the stakeholder, is interested in determining whether repurchased products should be the only ones included for the pet box subscription. Two of the major aspects we are interested in investigating for designing subscriptions are (1) repurchase and (2) sales. Also, it is important to note that the pet box subscription should be designed differently for different types of pets.

II-i. Questions to Consider

1. How many products are being purchased more than once?
2. Do the products being purchased again have better sales than others?
3. What products are more likely to be purchased again for different types of pets?

II-ii. Why Do People Subscribe?

According to *Pivotal* (2022), people subscribe for the following reasons:

- Convenience: Ability to repurchase through easy and automatic payment for every designated period (e.g., monthly, annually).
- Product tangibility: People feel a stronger connection and attraction to products they can physically receive at their door compared to other services like a video subscription.
- Adequate balance of control and choice: Subscribing allows one to access a decent amount of options (choice) as well as the ability to pause or resume their subscription (controlling their choice).
- A sense of community: Humans are social animals. Having the feel of connection to a specific brand will make them feel valued as a customer.

III. Process of Data Validation

First, we created a database and table in MySQL Workbench and imported the `pet_sales.csv` file, which added 879 observations to the system. Product ID, Product Category, Sales, Vendor ID, Pet Size, Pet Type, and Re-buy were imported as characters and the others were imported as numeric. Based on the data dictionary, we went over each of the features to verify their integrity and whether the data type is accurate for data analysis.

First of all, sales of products from last year should be numeric according to the data dictionary (and obviously due to its nature); hence, we converted it to a numeric type after removing the dollar signs (\$) and commas (,). While browsing through the types of pets available in the dataset, we noticed there are six different types in total, which includes the following: Birds, Cats, Dogs, Fish, Hamsters, and Rabbits. Since the analysis requires only the first four, 46 rows of hamsters and rabbits were omitted, leaving 833 rows.

Other variables seemed to be accurate, and this was easily verified with aggregate functions in MySQL such as `COUNT()`, `MAX()`, and `MIN()`, and queries like `GROUP BY`. Product and Vendor ID's are the primary keys since the count of these ID's match the total number of observations in the dataset. The dataset includes exactly 11 different product categories: 137 equipment, 137 toys, 71 supplements, 42 bedding, 72 medicine, 42 housing, 71 food, 42 clothes, 42 accessory, and 42 grooming products were entered in the dataset. Similarly, there are 5 different pet sizes: 98 extra small, 271 small, 270 medium, 97 large, and 97 extra large. Moreover, the ratings fall within the range of 1 to 10 as desired, with approximately 6.53 being the average rating. Finally, the number of repurchased products last year were 390 whereas 443 were not repurchased.

III-i. Monthly Cost for Each Pet Type

Notice that the dataset does not include the average monthly expenditure for each pet type. Using center values such as mean or median would not be sufficient since they do not capture the average monthly budget of a pet owner. Hence, based on internet research, we found that different types of pets have the following range or average of expenditure (in US dollars):

- Birds: 40 - 50
- Cats: 150 - 160
- Dogs: 150 - 350
- Fish: 40 - 50

Note that this depends on how old the pets are, how long the pet owner has had the pet for, the lifestyle of the pet owners, and many other factors. Since pet box subscriptions are meant to be budget-friendly, we are going to make the cost of pet box subscriptions for each pet type less than the lower range of monthly cost stated above. Therefore, we are going to filter out bird and fish products over \$40 and cat and dog products over \$150. This will result in 427 rows.

Now that the data validation is complete, we can move forward to data analysis.

IV. Data Discovery and Visualization

IV-i. Number of Products being Repurchased

Table 1: Count and Sales of Products

	Count of Repurchase	Sum of Sales
No	235	27590000
Yes	192	21826000
Grand Total	427	49416000

First, we can create a simple pivot table via Microsoft Excel to find the number of products that were repurchased by customers.

According to Table 1 above, there are 235 products (55.04%) that did not get purchased again whereas 192 products (44.96%) were purchased more than once. Similarly, the sum of sales last year for products that were not repurchased (27,590,000 USD) were greater than those that were repurchased (21,826,000 USD).

In general, majority of the products were not bought more than once and these kinds of products had higher sales last year compared to repurchased products.

IV-ii. Number of Repurchased vs. Non-Repurchased Products for each Product Category

Recall that the pet box subscription has to be tailored for different types of pets. Therefore, we need to first identify the popular product categories that are purchased more than once for different types of pets.

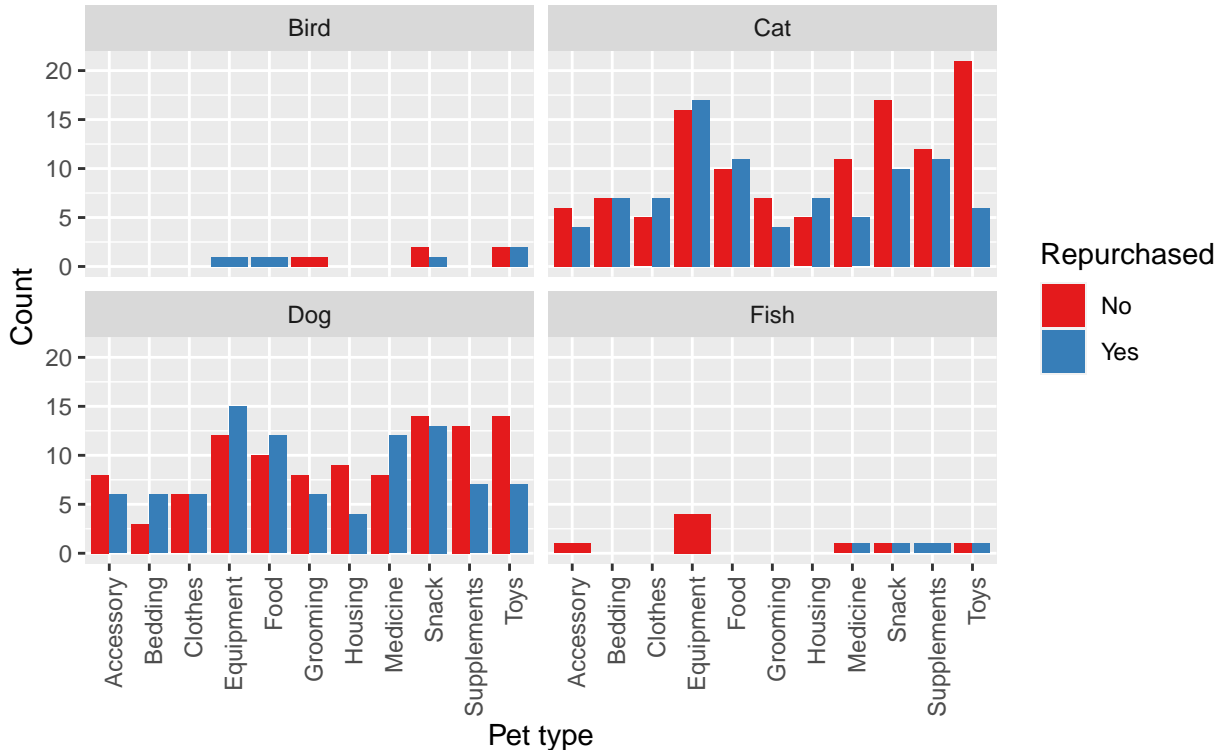


Figure 1
Number of products that were/were not repurchased for different product categories, by different types of pets.

Considering the aggregated data from Table 1, we can visualize the number of product categories that were repurchased for different types of pets (See Figure 1).

One prominent aspect we observe is that dogs and cats have more products compared to fish and birds. Thus, we might want to consider including more products for dogs and cats compared to fish and birds.

The product categories listed below for each type of pet are those with a higher or equal number of repurchased products than non-repurchased products. Note that the product categories with an asterisk (*) are the ones that have the highest counts among the repurchased products.

- Birds: Equipment, Food, Toys*
- Cats: Clothes, Equipment*, Food, Housing
- Dogs: Bedding, Clothes, Equipment*, Food, Medicine
- Fish: Medicine, Snack, Supplements*, Toys

IV-iii. Sales of Repurchased vs. Non-Repurchased Products for each Product Category

The sum of sales of each product category last year (See Figure 2) seems to have some overlaps with the findings from Figure 1.

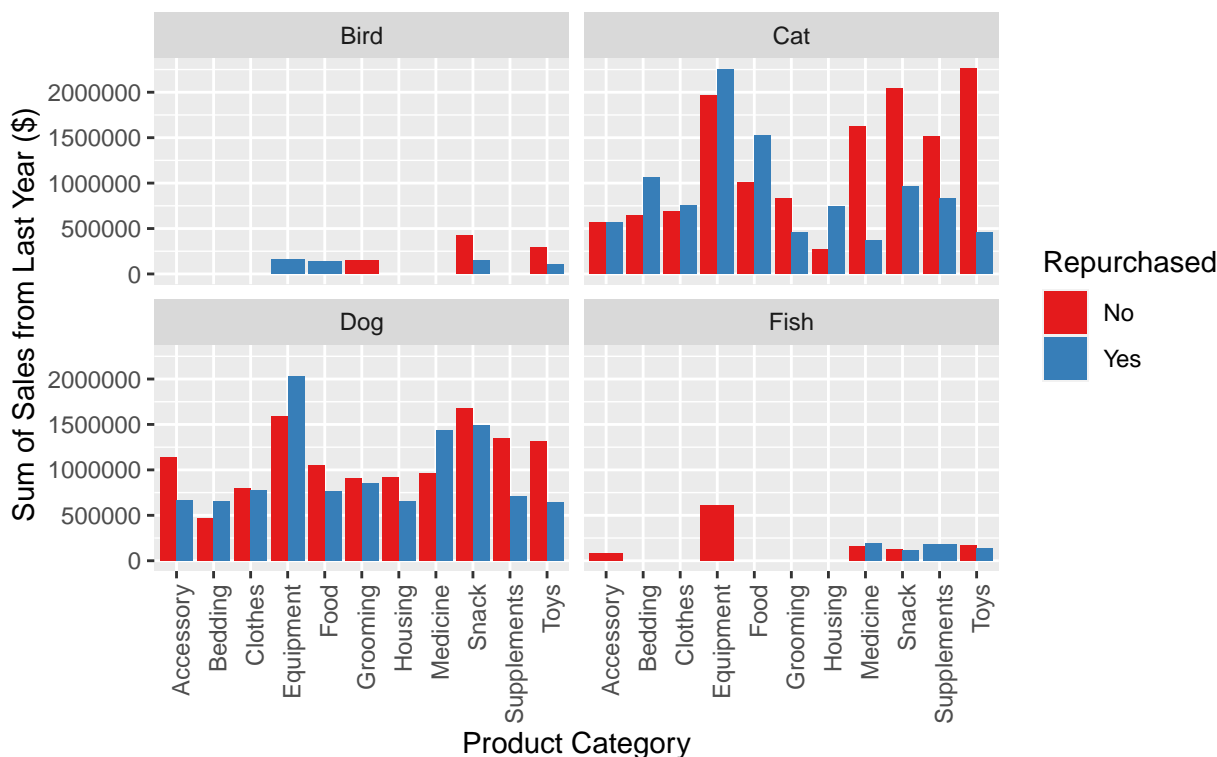


Figure 2
Sales of products that were/were not repurchased
for different product categories, by different types of pets.

Based on Figure 2 above, the product categories with higher total sales in repurchased products compared to non-repurchased products are listed below for each type of pet:

- Birds: Equipment*, Food
- Cats: Accessory, Bedding, Clothes, Equipment*, Food, Housing
- Dogs: Bedding, Equipment*, Medicine
- Fish: Medicine*, Supplements*, Toys

When solely looking at the repurchased products, we have the following listed as the top 5 product categories, in descending order:

Table 2: Top 5 Repurchased Product Categories with High Sales for each Pet Type

Pet type	Product Category	Total Sales
Bird	Equipment	157000
	Snack	146000
	Food	142000
	Toys	100000
Cat	Equipment	2255000
	Food	1529000
	Bedding	1066000
	Snack	966000
	Supplements	831000
Dog	Equipment	2027000
	Snack	1492000
	Medicine	1437000
	Grooming	852000
	Clothes	777000
Fish	Medicine	188000
	Supplements	177000
	Toys	133000
	Snack	111000

Based on Table 2, repurchased snacks seem to have relatively high sales for all types of pets. Moreover, Table 2 and Figure 2 suggest that equipment has the highest sales for birds, cats, and dogs.

In general, it is not necessarily the case that repurchased products have higher sales than non-repurchased products. For all pet types, non-repurchased products have higher sales and counts than those of repurchased products (See Table 3 below). Instead, it is the product category that matters within each type of pet since the sales and counts of repurchased products differ for each product category of pet types.

Table 3: Count and Sales of Products for each Pet Type

Pet type	Repurchased		Grand Total
Aggregated data	No	Yes	
Bird			
Sum of sales	863000	545000	1408000
Count of repurchase	5	5	10
Cat			
Sum of sales	13410000	9999000	23409000
Count of repurchase	117	89	206
Dog			
Sum of sales	12167000	10673000	22840000
Count of repurchase	105	94	199
Fish			
Sum of sales	1150000	609000	1759000
Count of repurchase	8	4	12
All pets			
Total Sum of sales	27590000	21826000	49416000
Total Count of repurchase	235	192	427

IV-iii.i. Combining Sales and Repurchase

The repurchase and sales results from above suggest that the following product categories are significant for each type of pet.

- Birds: Equipment, Food, Snack
- Cats: Equipment, Clothes, Food, Housing, Snack
- Dogs: Bedding, Equipment, Medicine, Snack
- Fish: Medicine, Supplements, Snack

IV-iv. Relationships between Variables

We can also fit logistic models to investigate whether price, rating, and sales are correlated with repurchase for each type of pet. Results of the logistic models would indicate the log-odds ratios of predictors (for repurchased and non-repurchased products) and their corresponding p-values. The log-odds ratios can be converted to odds ratios by simply exponentiating them.

Table 4: Logistic Regression Results

Predictors	Odds ratio	P-values
Bird		
Intercept	0.48	0.47
Price scaled	1.00	0.58
Rating scaled	0.91	0.53
Sales scaled	1.00	0.88
Pet size - extra small	0.46	0.61
Pet size - large	1.56	0.75
Pet size - medium	1.28	0.81
Pet size - small	2.85	0.43
Cat		
Intercept	1.04	0.90
Price scaled	1.00	0.18
Rating scaled	0.97	0.44
Sales scaled	1.00	0.91
Pet size - extra small	0.78	0.56
Pet size - large	0.89	0.79
Pet size - medium	0.88	0.71
Pet size - small	0.85	0.70
Dog		
Intercept	1.18	0.61
Price scaled	1.00	0.14
Rating scaled	0.86	<0.001
Sales scaled	1.00	0.90
Pet size - extra small	1.27	0.59
Pet size - large	0.69	0.39
Pet size - medium	1.24	0.62
Pet size - small	0.68	0.28
Fish		
Intercept	1.92	0.54
Price scaled	1.00	0.89
Rating scaled	1.82	0.06
Sales scaled	1.00	0.21
Pet size - extra small	0.00	0.99
Pet size - large	0.06	0.12
Pet size - medium	0.93	0.96
Pet size - small	0.38	0.38

According to the results (See Table 4), price, rating, and sales are not statistically significant for birds, cats, and fish based on the significance level $\alpha = 0.05$, meaning they are not meaningfully correlated with repurchase. A predictor is only statistically significant when it is smaller than α^1 . When it comes to dogs, we notice that the p-value of the odds ratio of rating is smaller than $\alpha = 0.05$. This means that the following interpretation is statistically significant:

- For every 1 rating increase in a dog product, a customer repurchasing that product decreases by 13.91% compared to other dog products, given that all other conditions remain constant.

Hence, we might want to consider a dog product with a lower rating when selecting products for the dog pet box subscription. Other factors are not statistically significant for dog products as well.

¹Although p-value is not the absolute standard all the time; Going in depth and discussing statistics would not be necessary for this report.

IV-v. Summary Statistics of Price

Although product price is not statistically correlated with repurchase, we will still use price to select the products for pet box subscription. This is to ensure that we are not forcing the customers to pay high subscription fees for expensive products within their pet box subscription. Hence, we can visualize the range of prices for each product category of pet type with boxplots. The prices of products we select for box subscriptions would not go beyond the 75th percentile, which is equivalent to the upper end of a box in the plot without the whiskers.

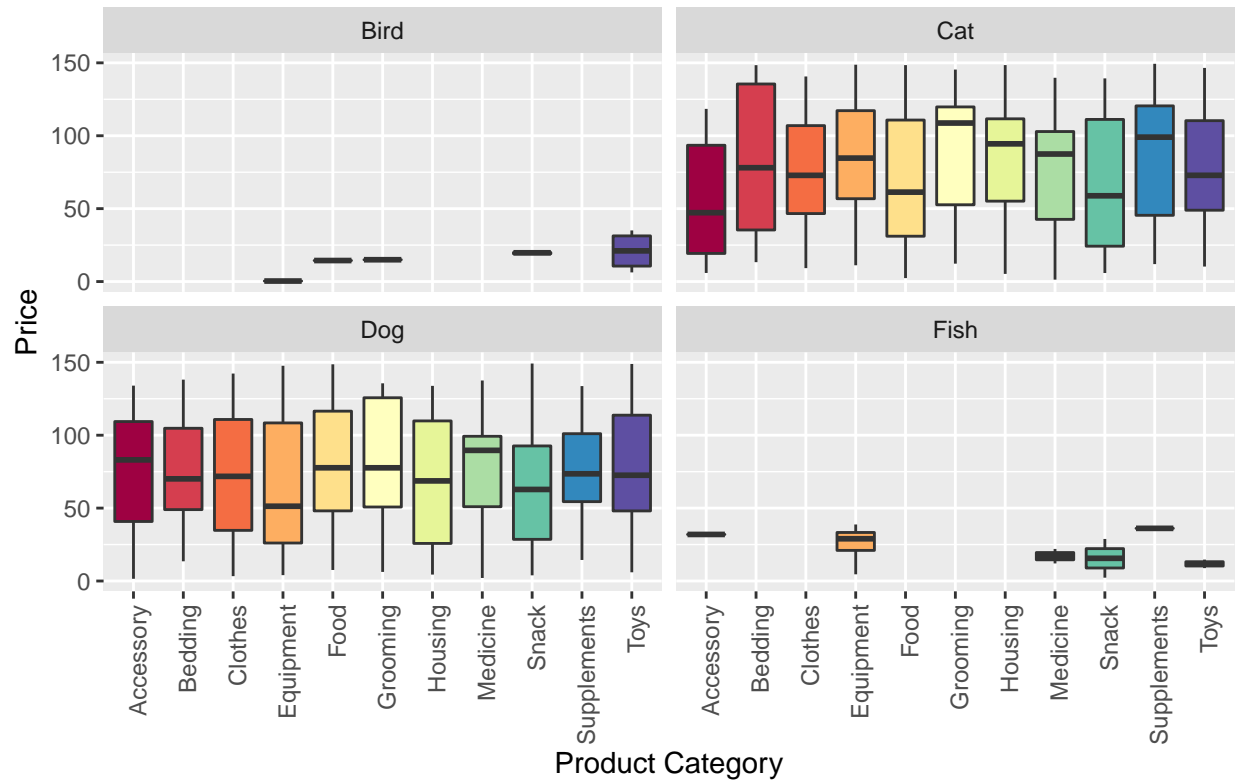


Figure 3
Range of product price for each product category of pet types.

V. Recommendations for Monthly Subscriptions

So far, we acquired the list of significant product categories for different types of pets based on repurchase and sales. We also noted that the products for birds and fish should be less than \$40, whereas those for cats and dogs should be less than \$150. Moreover, cats and dogs should have more products in their box subscription due to the fact that they have more products available and the difference in the amount of monthly spend. Rating was also an important factor for dog products. Considering such factors, Table 5 is a list of repurchased products with high sales in the product categories that we have defined as significant.

Table 5: List of Products

Pet type, Product Category	Product ID	Price	Rating	Sales
Bird				
Snack	4987	18.36	6	222000
Snack	5005	19.72	6	197000
Equipment	5037	0.35	7	157000
Snack	5017	20.15	6	146000
Food	4242	14.42	3	142000
Cat				
Snack	4777	45.23	7	229000
Food	4583	22.16	10	228000
Clothes	4663	43.90	10	224000
Food	4731	36.31	7	213000
Food	4689	31.10	10	199000
Food	4209	14.99	6	192000
Equipment	4797	24.10	7	189000
Equipment	4899	29.37	6	184000
Snack	4819	28.90	2	181000
Snack	4639	24.09	10	178000
Dog				
Snack	4430	66.40	6	229000
Snack	4948	94.25	6	221000
Snack	4792	20.97	7	217000
Equipment	4932	4.03	6	213000
Medicine	4414	52.82	3	206000
Equipment	4332	52.03	9	203000
Equipment	4842	14.55	1	199000
Bedding	4620	13.51	10	199000
Equipment	4860	17.46	1	191000
Snack	4816	70.90	2	189000
Fish				
Medicine	4271	22.01	4	188000
Supplements	4217	36.11	6	177000
Medicine	4205	12.05	1	156000
Snack	5008	2.28	6	127000
Snack	5014	28.85	6	111000

We will create the pet box subscription as diverse as possible with products from various product categories to make the tangible products more entertaining for customers. Recall that snacks had one of the highest sales among repurchased products (See Table 2). For all pet types, we will also have customers choose a snack sample among a few options given. This would make the subscription feel more unique for themselves and make them feel respected.

The product ID's for each type of pet listed below are the specific products for the corresponding pet box subscription. After a certain amount of time, the products will change to different products within the same product categories to ensure customers would not lose interest.

A discount will be applied to all products in the pet box subscriptions so that the price of products would be cheaper than when they are bought individually. The amount of discount is to be discussed. The prices indicated below are before discounts are applied and before adding a snack sample.

V-i. Pet Box Subscription - Birds

Pet Box Price: \$14.77

- Equipment: 5037
- Food: 4242
- Snacks: Choose one from 4987, 5005, 5017

V-ii. Pet Box Subscription - Cats

Pet Box Price: \$90.16

Food: 4583 Clothes: 4663 Equipment: 4797 Snack: Choose one from 4777, 4819, 4639

V-iii. Pet Box Subscription - Dogs

Pet Box Price: \$70.36

Snack: Choose one from 4430, 4948, 4792, 4816 Equipment: 4932 Medicine: 4414 Bedding: 4620

V-iv. Pet Box Subscription - Fish

Pet Box Price: \$58.12

Snack: Choose one from 5008, 5014 Medicine: 4271 Supplements: 4217

VI. Limitations

VI-i. Monthly Expenditure Per Customer

It would have been more ideal to know the average or median budget of a PetMind customer for each type of pet. That way, it would have been easier to decide on the price for the pet box subscriptions and their corresponding products.

VI-ii. Survey

As we have seen in the results of logistics regression models for each pet type, the price, rating, or pet size did not significantly correlate with repurchase (except for rating of dogs products). Therefore, it was difficult to identify the factors that led to repurchasing a product. Following-up with the customers with a survey and extracting qualitative or quantitative data could give a better insight in the preferences of customers.

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