**Question 19.1**

Describe analytics models and data that could be used to make good recommendations to the retailer. **How much shelf space should the company have, to maximize their sales or their profit?**

Of course, there are some restrictions – for each product type, the retailer imposed a minimum amount of shelf space required, and a maximum amount that can be devoted; and of course, the physical size of each store means there’s a total amount of shelf space that has to be used. But the key is the division of that shelf space among the product types.

For the purposes of this case, I want you to ignore other factors – for example, don’t worry about promotions for certain products, and don’t consider the fact that some companies pay stores to get more shelf space. Just think about the basic question asked by the retailer, and how you could use analytics to address it.

As part of your answer, I’d like you to think about how to *measure* the effects. How will you estimate the extra sales the company might get with different amounts of shelf space – and, for that matter, how will you determine whether the effect really exists at all? Maybe the retailer’s hypotheses are not all true – can you use analytics to check?

Think about the problem and your approach. Then talk about it with other learners, and share and combine your ideas. And then, put your approaches up on the discussion forum, and give feedback and suggestions to each other.

# You can use the {given, use, to} format to guide the discussions: Given {data}, use {model} to {result}.

One of the key issues in this case will be data – in this case, thinking about the data might be harder than thinking about the models.

**Exploratory: Shelf Space**

In the simplest and most straight forward method, determining the relationship between shelf space and profit could be done using quasi-experimentation or a/b testing between stores. Within store comparison would take too much time, therefore it will be best to identify stores with similar revenue on similar product range and space. With that, we will be able to test for the main effects of shelf space on products on a diverse range of products split into large-space vs. small-space allocation.

**Exploratory: Complimentary Products**

To identify products that were often purchased together, clustering or Louvain community algorithms can be one of the options. However, in this context, I believe Market Basket analysis (or affinity clustering) would be more suitable. It is a technique that finds strength of association between products often purchased together. On top of that, we will also be able to identify the order of purchases between complimentary products allowing for proper product placement. Product associations would probably be closely related to customer base types in each store location; thus, these associations might be unique between stores.

**Optimization: Product Category**

Given results from Market Basket analysis, products often bought together should be placed closer to each other. However, one restriction that the retailers have to take note is that products need to be placed with their own categories. It will be a mess if we were to arrange products according to the results directly. Therefore, optimization of distance would still need to be used for the best category location arrangement.

# Optimization: Shelf Space

# With results from the Shelf Space hypothesis testing, space allocated to a specific product within each category will be scaled according to different requirements, be it profit margin, demand, stakeholder requirements, or even product expiry. In the event that profit is the objective, optimization of shelf space allocation could also be used to focus on products with a larger pool of complimentary (related) products so that higher sales of that product will lead to higher sales of others.

# Optimization: Customer Exposure (Distance Walked)

With the optimal product shelf space allocation and product category arrangement identified, it is time to target the less popular products to allow for more customer exposure. Since popular products will be purchased regardless, by placing unpopular products between popular product clusters would allow for more customer exposure as they would have to walk past these products first before reaching their target. This way, we would be able leverage on customer’s demand to gain more ‘advertisement’ time.

# Wildcard: Small Ticket Items

Another strategy for revenue maximization would be to leverage on small ticket items. Similar to placing sweets closer to the cashiers, small ticket items that does not have a specific category and would not hurt the wallet much could be placed around popular product clusters for easy grab. Often, such purchases are impulsive and the small revenue could add up to be significant.