

Homework Assignment 2

Data Warehousing and Profitability Analysis

Part1

1. Perform a profitability analysis by machine for the machines at WPI. Which machines/locations are most profitable? Which machines/locations are least profitable? Explain. (hint: You will need to use an appropriate formula to calculate profit in Excel.)

Based on the given data

Most Profitable machines/locations

Washburn Bldg 2nd floor - \$22,337

Gordon Lib Bldg 3rdd floor - \$14,900

Salisbury Lab Bldg 2nd floor - \$10,933

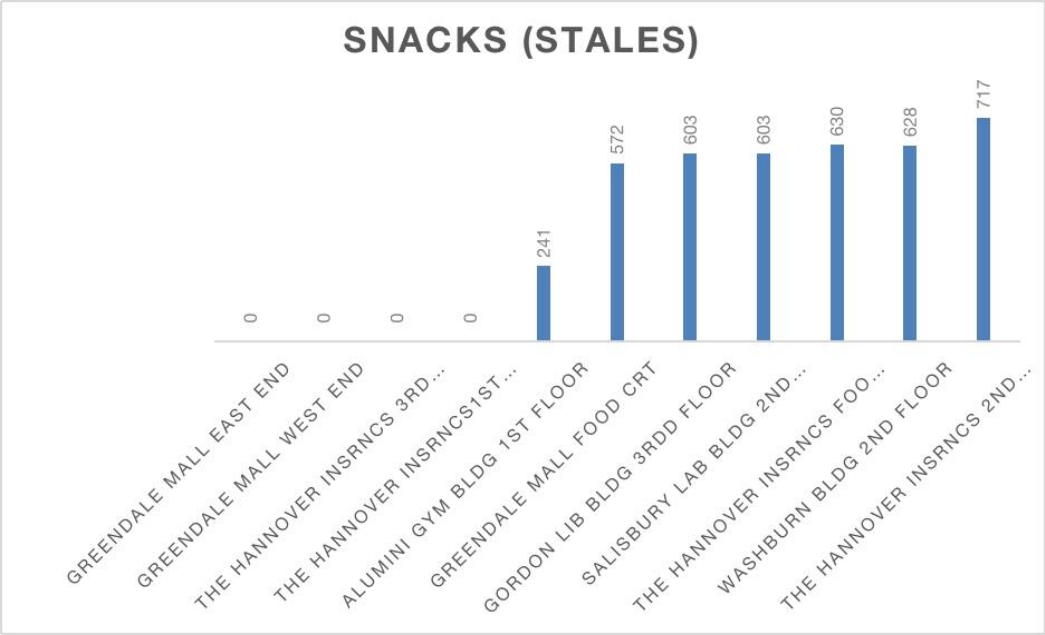
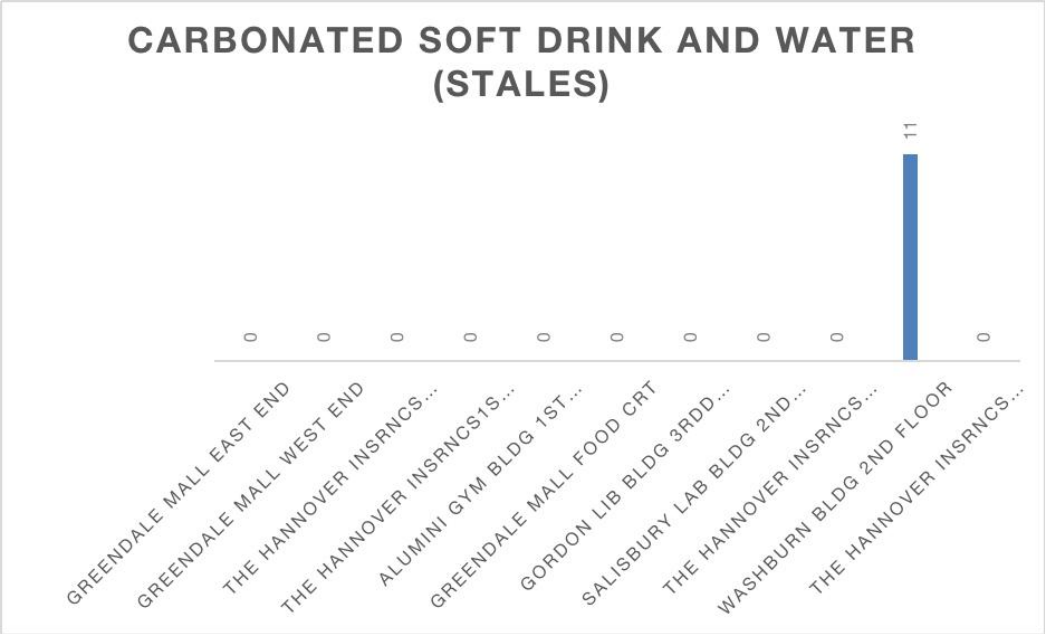
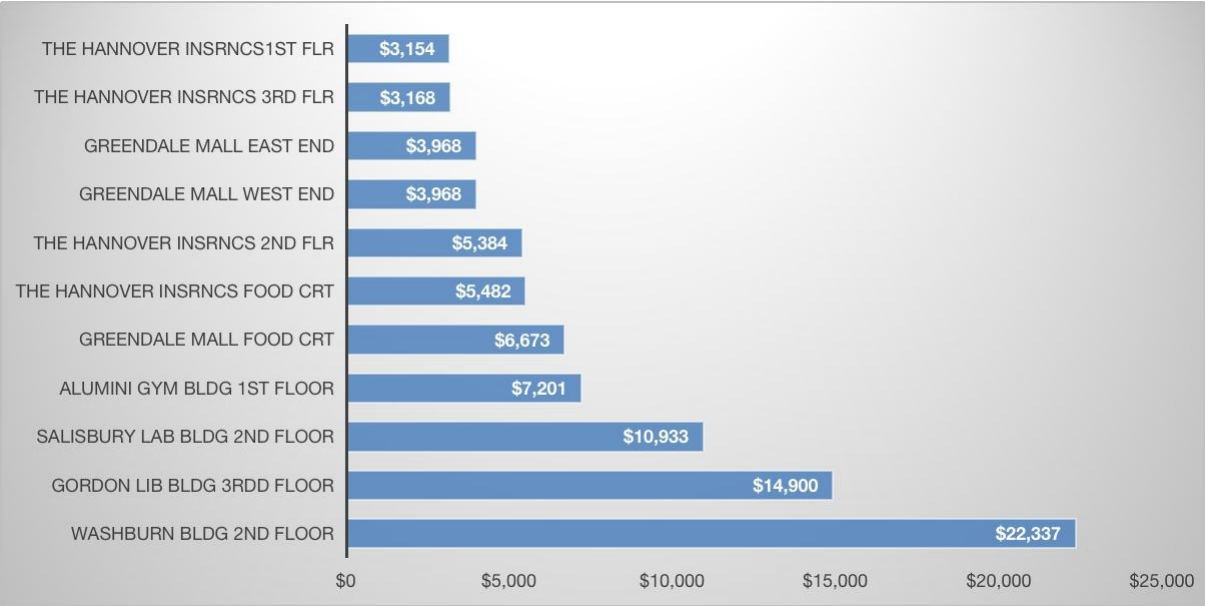
Least Profitable machines/locations

Greendale Mall East and West end - \$3,968

The Hannover Insrnecs 3rd flr - \$3,168

The Hannover Insrnecs1st flr - \$3,154

mac_lcn_adrs_scnd_line	Sum of Profit (Used Products)
Washburn Bldg 2nd floor	\$22,337
Gordon Lib Bldg 3rdd floor	\$14,900
Salisbury Lab Bldg 2nd floor	\$10,933
Alumini Gym Bldg 1st floor	\$7,201
Greendale Mall Food crt	\$6,673
The Hannover Insrnecs food crt	\$5,482
The Hannover Insrnecs 2nd flr	\$5,384
Greendale Mall west end	\$3,968
Greendale Mall East end	\$3,968
The Hannover Insrnecs 3rd flr	\$3,168
The Hannover Insrnecs1st flr	\$3,154
Grand Total	87168.47



Sum of fact restock unit cnt	prod ctgry desc	
mac_lcn_adrs_scnd_line	Carbonated soft drink and Water	Snacks
Washburn Bldg 2nd floor	13566	16284
Gordon Lib Bldg 3rdd floor	13542	8097
Salisbury Lab Bldg 2nd floor	6807	8154
Alumini Gym Bldg 1st floor		8154
Greendale Mall Food crt		7905
The Hannover Insrncs food crt		6654
Greendale Mall west end	6651	
Greendale Mall East end	6651	
The Hannover Insrncs 2nd flr		6633
The Hannover Insrncs 3rd flr	5310	
The Hannover Insrncs1st flr	5286	

Sum of fact stale unit cnt	prod ctgry desc	
mac_lcn_adrs_scnd_line	Carbonated soft drink and Water	Snacks
Greendale Mall East end	0	
Greendale Mall west end	0	
The Hannover Insrncs 3rd flr	0	
The Hannover Insrncs1st flr	0	
Alumini Gym Bldg 1st floor		241
Greendale Mall Food crt		572
Gordon Lib Bldg 3rdd floor	0	603
Salisbury Lab Bldg 2nd floor	0	603
The Hannover Insrncs food crt		630
Washburn Bldg 2nd floor	11	628
The Hannover Insrncs 2nd flr		717

The profitability of each location is evaluated by the sum of profits from used products (removing stale products from the count), reflecting the revenue generated by vending machines at each location. "Washburn Bldg 2nd floor", "Gordon Lib Bldg 3rd floor", and "Salisbury Lab Bldg 2nd floor" stand out as the most profitable locations while "Greendale Mall West end" & "Greendale Mall East end" (as they share the same profit), "The Hannover Insrncs 3rd flr" and "The Hannover Insrncs 1st flr" stand out as the least profitable locations. Based on the analysis, it can be seen that the most profitable locations are well stocked with both "Carbonated soft drink and Water" and "Snacks" whereas the least profitable locations are only stocked with "Snacks". The profitability may be attributed to a balanced product mix that caters to diverse consumer preferences, effective inventory management, and an understanding of local preferences. Although there are no stales in the least profitable zone still they are not equipped with the "Snacks" stock which might be a preferable product by the consumer as more data (consumer preferences, product popularity etc.) would be needed to evaluate this hypothesis.

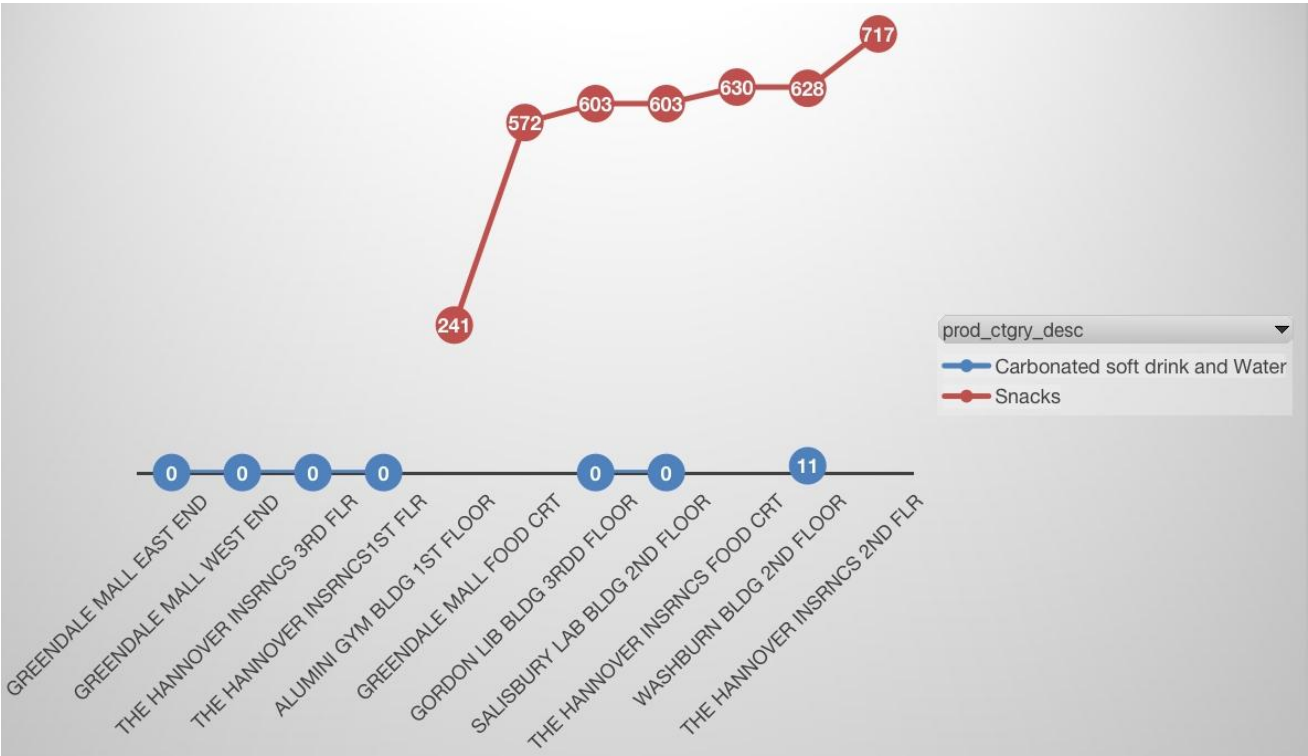
2. How does usage (represented by stocking and stales) differ for machines at malls vs. companies vs. schools (WPI)? Explain.

mac_lcn_ctgry_desc	mac_ctgry_desc	mac_lcn_adrs_scnd_line	Sum of fact_stale_unit_cnt	Sum of fact_restock_unit_cnt	Percentage of Sale Based on Restock
Mall			572	21207	2.70%
	Carbonated soft drink and Water		0	13302	0.00%
		Greendale Mall East end	0	6651	0.00%
		Greendale Mall west end	0	6651	0.00%
	Snacks		572	7905	7.24%
		Greendale Mall Food crt	572	7905	7.24%
Company			1347	23883	5.64%
	Carbonated soft drink and Water		0	10596	0.00%
		The Hannover Insrncs 3rd flr	0	5310	0.00%
		The Hannover Insrncs1st flr	0	5286	0.00%
	Snacks		1347	13287	10.14%
		The Hannover Insrncs 2nd flr	717	6633	10.81%
		The Hannover Insrncs food crt	630	6654	9.47%
School			2086	74604	2.80%
	Carbonated soft drink and Water		11	33915	0.03%
		Gordon Lib Bldg 3rdd floor	0	13542	0.00%
		Salisbury Lab Bldg 2nd floor	0	6807	0.00%
		Washburn Bldg 2nd floor	11	13566	0.08%
	Snacks		2075	40689	5.10%
		Alumini Gym Bldg 1st floor	241	8154	2.96%
		Gordon Lib Bldg 3rdd floor	603	8097	7.45%
		Salisbury Lab Bldg 2nd floor	603	8154	7.40%
		Washburn Bldg 2nd floor	628	16284	3.86%
Grand Total			4005	119694	3.35%

The analysis reveals a slight difference in usage between machines at malls and schools compared to those at companies. Notably, the percentage of stocks that go stale is 2.7% in malls, 2.8% in schools, and a higher 5.6% in companies. This higher percentage in companies may indicate a potential bottleneck in inventory management, suggesting shifts in foot traffic, product popularity, or local preferences over time (assuming stocking quantities are based on historical data). A higher usage, as indicated by the elevated stale percentage in companies, suggests more dynamic demand, resulting in increased restocking activities and a higher likelihood of stales being removed. Conversely, lower usage, reflected by lower stale percentages in malls and schools, may indicate stable or lower demand, leading to fewer restocking activities and consequently fewer stales. Given that only snacks have a short shelf life, effective inventory management should primarily focus on the stocking of snacks, taking the expiration factor into account. This strategic approach can help optimize inventory levels, address the observed bottleneck, and enhance overall inventory management efficiency.

3. Do machines differ by the number of stales? Which ones have the higher number of stales? Which ones have lower number of stales? Explain.

Sum of fact stale unit cnt	prod_ctgry_desc
mac_lcn_adrs_scnd_line	Carbonated soft drink and Water Snacks
Greendale Mall East end	0
Greendale Mall west end	0
The Hannover Insrncs 3rd flr	0
The Hannover Insrncs1st flr	0
Alumini Gym Bldg 1st floor	241
Greendale Mall Food crt	572
Gordon Lib Bldg 3rdd floor	0 603
Salisbury Lab Bldg 2nd floor	0 603
The Hannover Insrncs food crt	630
Washburn Bldg 2nd floor	11 628
The Hannover Insrncs 2nd flr	717



% of fact stale unit cnt	
mac_lcn_adrs_scnd_line	Carbonated soft drink and Water Snacks
Greendale Mall East end	0.00%
Greendale Mall west end	0.00%
The Hannover Insrncs 3rd flr	0.00%
The Hannover Insrncs1st flr	0.00%
Alumini Gym Bldg 1st floor	2.96%
Greendale Mall Food crt	7.24%
Gordon Lib Bldg 3rdd floor	0.00% 7.45%
Salisbury Lab Bldg 2nd floor	0.00% 7.40%
The Hannover Insrncs food crt	0.00% 9.47%
Washburn Bldg 2nd floor	0.08% 3.86%
The Hannover Insrncs 2nd flr	10.81%

mac_lcn_adrs_scnd_line	Carbonated soft drink and Water		Snacks	
	Sum of fact_stale_unit_cnt	Sum of fact_restock_unit_cnt	Sum of fact_stale_unit_cnt	Sum of fact_restock_unit_cnt
Greendale Mall East end	0	6651		
Greendale Mall west end	0	6651		
The Hannover Insrncs 3rd flr	0	5310		
The Hannover Insrncs1st flr	0	5286		
Alumini Gym Bldg 1st floor			241	8154
Greendale Mall Food crt			572	7905
Gordon Lib Bldg 3rdd floor	0	13542	603	8097
Salisbury Lab Bldg 2nd floor	0	6807	603	8154
The Hannover Insrncs food crt			630	6654
Washburn Bldg 2nd floor	11	13566	628	16284
The Hannover Insrncs 2nd flr			717	6633

The analysis of stale units across various vending machine locations reveals distinct usage patterns, shedding light on factors such as product stocking strategies and potential inventory management challenges. Notably, "Greendale Mall East end," "Greendale Mall West end," "The Hannover Insrncs 3rd flr," and "The Hannover Insrncs 1st flr" do not stock snacks, which have a limited shelf life, resulting in no indication of stales for these locations. This deliberate choice in product assortment could reflect a strategic decision based on consumer preferences or logistical considerations. However, a noteworthy observation is found at "Washburn Bldg 2nd floor," which records 11 stale products for "Carbonated soft drink and Water" despite no defined shelf life for this product category. This anomaly suggests a potential discrepancy in recording or data accuracy, warranting further investigation into the reporting process for this particular location. For the remaining locations, such as "Alumini Gym Bldg 1st floor," "Greendale Mall Food crt," "Gordon Lib Bldg 3rdd floor," "Salisbury Lab Bldg 2nd floor," "The Hannover Insrncs food crt," and "The Hannover Insrncs 2nd flr," there appears to be a correlation between the number of stale products and the restocking quantity. An increase in restocking quantities coincides with a rise in stale product counts, indicating potential challenges in inventory management or shifts in product popularity or local preferences. This pattern could suggest a need for more dynamic stocking strategies to align with varying consumer demands. Furthermore, a closer look at the percentage of stales reveals that "Alumini Gym Bldg 1st floor" (2.96%) and "Washburn Bldg 2nd floor" (3.86%) have the lowest stale percentages, suggesting effective inventory control or stable demand. In contrast, "The Hannover Insrncs 2nd flr" (10.81%) and "The Hannover Insrncs food crt" (9.47%) exhibit the highest stale percentages, indicating potential challenges in meeting dynamic demand or inventory management optimization opportunities.

4. What are the managerial implications of these results? In other words, based on the results of your analysis, what are your three major recommendations to the manager of the vending machine company to improve their profit? Explain.

The managerial implications of the analysis provide valuable insights for optimizing the profitability of the vending machine company. Firstly, the identification of the most and least profitable locations suggests a need for a strategic approach to product assortment and stocking. Machines in high-performing locations like "Washburn Bldg 2nd floor," "Gordon Lib Bldg 3rd floor," and "Salisbury Lab Bldg 2nd floor" exhibit a balanced mix of both "Carbonated soft drink and Water" and "Snacks." Therefore, the recommendation is to align product stocking strategies with consumer preferences and market demands. For less profitable locations such as "Greendale Mall East end," "Greendale Mall West end," "The Hannover Insrnecs 3rd flr" and "The Hannover Insrnecs 1st flr," diversifying the product mix by introducing more popular items could potentially enhance revenue generation. Additionally, exploring consumer preferences through surveys or market research can provide valuable insights for optimizing the product assortment in these locations. Secondly, the analysis of usage patterns across malls, companies, and schools highlights a potential bottleneck in inventory management for machines in companies. The higher percentage of stale units in company locations (5.6%) compared to malls (2.7%) and schools (2.8%) indicates a need for more dynamic inventory control. The recommendation here is to implement a data-driven approach to inventory management, leveraging real-time data on consumer preferences, foot traffic, and historical sales patterns. This can facilitate more accurate demand forecasting and timely restocking, reducing the likelihood of stale products and improving overall machine performance. Thirdly, the examination of stale units across various locations reveals a correlation between restocking quantities and stale counts. Locations with higher restocking quantities tend to have more stale products, indicating potential challenges in managing inventory levels effectively. The recommendation is to implement a more nuanced restocking strategy that considers not only historical sales data but also factors in dynamic consumer preferences and seasonal variations. Regularly reviewing and adjusting restocking quantities based on evolving market trends can lead to better inventory optimization, minimizing stale product counts, and improving profitability. In conclusion, the manager of the vending machine company should focus on strategic product assortment, implement data-driven inventory management practices, and fine-tune restocking strategies based on real-time market dynamics. These recommendations aim to enhance overall profitability by aligning product offerings with consumer demand, improving inventory control, and minimizing stale product occurrences across machine locations.

Part2

1. What is the need for data warehousing at Acme? Explain in a paragraph.

According to the article at Acme, the need for data warehousing arises from the complex and heterogeneous nature of its business processes and IT systems. Firstly, they were facing issues like shrinkage accounting for a significant percentage (1.2 to 1.5%) of total sales and issues in supply chain management, and without a centralized data hub, it's tough to figure out why it's happening and hinders the company's ability to identify root causes and take concrete actions for improvement as the company planned to reduce the shrinkage to 0.6% in the next three years based on their plan for coming years. A data warehouse would bring all our data together, helping them understand and tackle these discrepancies. Secondly, their existing supply chain was complicated. Inaccurate forecasts, delayed shipments, and damaged items were causing problems. Although they had systems to monitor and record the data they had problems like variations of installed configurations and different software which resulted in poor communication between the systems. The challenge was in accessing timely, relevant, and accurate information due to the diverse range of relational database products, multiple ERP vendor solutions, and varying configurations across its operating units. A data warehouse can bring everything into one place, giving a clearer picture of inventory, sales, and logistics which can help improve forecasts, streamline operations, and make the supply chain more efficient. Finally, The marketing and sales team wanted to introduce a loyalty card and improve promotions, but their current setup was not suitable to provide the full picture of sales across stores. A data warehouse would help the sales and marketing teams to analyze data better, allowing them to measure the success of their programs and make necessary improvements to retain customers. In simple terms, a data warehouse was crucial to solving the current challenges, making better decisions, improve various aspects of Acme's business, ultimately contributing to overall profitability and operational efficiency.

2. Design a multi-dimensional model (i.e., star/snowflake schema) for the retail product returns process (see the data warehouse business matrix in that article). Each table/entity, including the dimensions and the fact table, should have at least three attributes including a primary key (and a foreign key, if needed). You can simply use Shapes in MS Word to draw the model. However, if you decide to use any other tools (e.g., Lucidchart or Visio), just provide an image or screenshot of the model here. For the connections (relationships) between entities in the model you can use simple lines or arrows; you do not have to add other details to the connections.

