GROUP COURSEWORK

Data Analytics and Organisational Decision Making

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Group 31

Equal marks for all

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35341734

35413204

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35441402

35422033

Word count: 6007.

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Task A

Introduction

The case study looks at the challenges Malaysian business bank BankX had implementing big data analytics. BankX seeks to use big data analytics, streamline processes, and improve decision-making to remain competitive in the ever-changing financial environment. Data integration, legacy systems, and the laborious process of implementing changes inside the traditional banking structure present difficulties for the bank, though.

The recommended remedy is to migrate to cloud-based services, which allow synchronisation between several legacy systems and a single data store. But the CEO challenges conventional wisdom and expresses worries about security risks.

The paper talks about the potential difficulties BankX would run into putting data analytics into practice as well as how it might affect the way decisions are made now. The report also covers the actions BankX should take to rank and deal with the issues.

Challenges

1. **Legacy Systems**

   Resources managing the outdated systems is known as resource redundancy. For many years, the banking industry and some financial firms have been using outdated systems. They were created with big transaction handling mainframe systems. Developed to carry out basic tasks such deposits, withdrawals, loans, and accounting utilising an integrated codebase, these systems are rigid. Integration with external systems becomes challenging without human intervention since the data stored is unique to the distinct systems. While FinTech companies, or Non-Banking Financial Institutions (NBFIs), that use FinTech solutions may have an advantage over banks because they have the initial IT infrastructure to implement them faster and the economies of scale and scope to make them a vehicle for profitability (Murinde, Rizopoulos and Zachariadis, 2022).

   Using low-level assembly programming, FORTRAN, and COBOL, legacy banking systems are language-dependent and stiff (Butler, 2004). The information is kept as inflexible parent-child connections in hierarchical databases or flat files. The expense of changing such complicated systems, which could have an impact on banks' everyday operations, keeps analytical and risk management methods in legacy systems even when they are out of date. The inexperience of the new developers with the outdated programming languages in use adds additional obstacles. Different integration solutions evolved since it soon became evident that it was difficult to totally

rebuild them. The Object Management Group's CORBA standard proved to be the most powerful of these new integration techniques, offering a standards-based solution that made mainframe applications peer in a distributed computing environment. Still, the criteria did not end there. Any integration plan required to make sure that the new distributed systems did not lose any of the advantages of the mainframe systems, which were fast, scalable, and dependable (Butler, 2004).

2. **Compliance/ Regulatory Challenges**

   Data compliance, regulatory reporting, governance. Having accumulated decades of regulatory actions, supervisory efforts, and government assurances, banking is one of the most heavily regulated sectors in the world of commerce. This means that the financial intermediaries operating in this environment can be trusted to protect people's money (Murinde, Rizopoulos and Zachariadis, 2022). For one thing, stability, integrity, and protection of customers all depend on regulation. On the flip side, this makes it more difficult to develop and stay up with emerging fintech firms (Murinde, Rizopoulos, and Zachariadis, 2022). When banks conduct business internationally, data privacy regulations vary throughout many countries. There is no standardisation, hence these disparate rules and regulations lead to complexities.

3. **Resource Management**

   Staffing, technical, financial, organisational hierarchy changes, attrition. In ASEAN countries, implementing data analytics in old bank systems poses a number of difficulties, especially with regard to technical and financial resource management. Embracing agile development principles is one of these challenges (Catherine, 2020); another is the significance of data analytics in the banking industry, with an emphasis on fraud detection (Jamar, 2017); and still another is the effect of big data analytics on sustainability and financial performance (Ali, 2020). These research taken together demonstrate how intricately technology, financial resources, and organisational culture interact to enable the effective use of data analytics in old bank systems.

4. **Socio-technical challenges - Resistance to change, cultural transformation**

   The degree of relevance and competition of a company determines how much of an influence data analysis has (Pham Minh et al., 2023). Some staff members who are used to working in a current way may complain since BankX data analysis fundamentally changes the workflows, processes, and decision-making processes of an organisation (Kotter, 2006). Bank X will need to undergo a cultural change in order to embrace a data-driven mindset, encourage data literacy, and foster a culture of continuous learning and development. The two biggest challenges will be changing the organisational culture and getting over employee resistance (Davenport, 2005). This is due of the fears and anxieties of employees about changes such as fear of losing their jobs, general hesitation, and misunderstanding of the advantages (Fuchs et al., 2023) Overcoming these

socio-technical obstacles would need effective change management techniques, education, and communication (By, 2005).

5. **Client Expectations, Market Standards**

   Customers nowadays want from their banks flawless digital experiences, real-time analytics, and customised services. By providing more specialised goods, quicker decision-making, and better customer service, banks can better satisfy these changing customer expectations (Davenport, 2005).

   But the bank also has to think about the expectations and market norms that its rivals—especially fintech firms that have embraced digital technology and data analytics quickly—have set (How to thrive in an uncertain future Contents of open banking, no date. A bank can be at a competitive disadvantage if it does not stay current with market demands and industry changes (Davenport, 2015). To keep competitive and satisfy clients, the bank must thoroughly examine the market environment, comprehend consumer tastes, and match its data analytics approach with the changing industry norms (Davenport, 2015).

6. **Non-Programmed decision making / Bounded Rationality**

   Constrained rationality is an important concept that shapes the way plans of action and decisions are created in the setting of organisational decision-making. According to Herbert Simon's limited rationality theory, decision-makers usually have to make decisions while having limited resources, cognitive abilities, and incomplete knowledge (Herbert, 1957). Through providing more comprehensive data and insights to support decision-making, data analytics can help go above these limitations (Davenport, 2015). The bank must ensure that human judgement and decision-making are improved rather than replaced, though, and be conscious of the limitations of data analytics. Performance of the bank will rely on developing a well-rounded approach that combines the benefits of data-driven and non-programmed decision-making (Davenport, 2015).

7. **Data Security (Cloud)**

   Cloud computing has completely changed big data processing in the financial services sector by providing more operational efficiency, scalability, and flexibility for prompt decision-making. New worries about data security and privacy are raised by this move to cloud-based infrastructure, nevertheless. (Naidu et al., 2022)

Attacks	Description
Denial of Service (DoS) Attack	Overloads a cloud service with excessive requests, making it unavailable to legitimate users.
Attack on Hypervisor	Exploits vulnerabilities in the hypervisor layer of virtualized environments to gain unauthorised access or control over multiple guest virtual machines.
Resource Freeing Attacks	Maliciously consumes or exhausts cloud resources (such as CPU, memory, or storage) to disrupt service availability for other users.
Side Channel Attacks	Exploits information leakage through indirect channels (e.g., timing or power consumption) to infer sensitive data processed within the cloud.
Attacks on Confidentiality	Involves unauthorised access or interception of data in transit or storage within the cloud, compromising its confidentiality and privacy.

Table 1: Cyber attacks on the cloud (Alani, 2014).

Eavesdropping to complete system failure are among the attacks against cloud computing. Trojan injection attacks are one major concern since they allow malevolent actors to sabotage cloud functioning by sending valid user requests to hacker-controlled modes and leaving dangerous code behind. (Kanaker et al., 2022)

Sensitive financial information must be protected and data protection regulations must be followed by banks by putting in place robust data encryption methods, firewall setup and maintenance, stringent access restrictions, patch management, and comprehensive governance frameworks (Alani, 2014). Important information assets will be private, honest, and available while the risks associated with cloud-based data processing are minimised by implementing these protections. (Kanaker et al., 2022)

Impact of data analytics on current decision-making practices

Using cutting edge technology, algorithms, and statistical techniques, data analytics examines datasets to find important patterns and insights that can inform strategic decision-making.

1. **Data-driven decision-making**

With data analytics, the bank would be able to compile insights from both historical patterns and real-time data. Introducing data analytics would bring in a culture of data-driven decision-making as opposed to conventional methods of making judgements based on intuition and experience.

Better risk evaluations, pricing strategies, investment decisions, and promotional efforts result from more precise decisions and tactics based on data insights. (Tomych, 2023)

2. **Marketing Strategies**

   The bank would be better able to create economical marketing plans with data analytics. The bank could get an understanding about the tastes and behaviour of its clients. The bank could fully understand their customers and tailor products and services to individual interests by analysing consumer data. (Staff GBAF Publications, 2024.). Insights into client data would also enable the bank to create precise customer segments for efficient targeted marketing, which would raise revenue and cut expenses.

3. **Streamlining Operations**

   BankX is the result of several mergers over the years, hence it has several systems and procedures. By bringing in a shared infrastructure and platform, data analytics could simplify processes.

   a) **Credit Risk Assessments**

      Analytics would let the bank to improve the credit risk assessment model's efficacy. The bank might examine a tonne of data using data models to assess applicants' creditworthiness and decide which loans to make. (Mule, 2023)

   b) **Compliance**

      Data analytics would enable the bank to enhance and automate compliance and monitoring procedures like transaction monitoring, fraud detection, and client screening.

   c) **Regulatory Reporting**

      Terabytes of institution data are gathered, combined, and used by regulatory reporting services. The Bank may better control the data supply chain from ingest to reporting and convert their reports into analysis and insights for important decision-making. (EY, 2020)

   d) **Accounting**

      The ability of the bank to employ data models to assess financial accounts, create cost structures, and use predictive analytics for financial forecasts will revolutionise standard accounting methods.

4. **Organisational Structure/Hierarchy**

   As the case study makes clear, the bank created a separate analytics stream within its company that focused on web-analytics. To activate big data analytics activities, it also brought new positions, teams, and departments. Moreover, it began to simplify its data-related operations by a number of steps, such as personnel upskilling and data integration in a consolidated data warehouse. (Siew & Farouk, 2023)

Prioritising Addressing the Challenges

The bank needs to tactically prioritise addressing the challenges using a set of organisational decision-making models and theories that are easy to comprehend and implement.

1. **Multi-Criteria Decision Making (MCDM)**

   MCDM can help structure complex decision-making problems with various dimensions and explore promising courses of action to converge towards optimal solutions. (Mathirajan, et al., 2017)

   - MCDM can be used by the bank to evaluate different options according to their related costs, benefits, and possible hazards while developing a data transfer plan. Rehosting, refactoring, and rearchitecting are a few of the migration techniques that might be compared. (Zawadzki, 2024)
   - Comparably, when dealing with problems with legacy systems, MCDM could be used to assess modernization or replacement possibilities. This could require comparing the costs and benefits of several options, such as replacing the old system with a new one or switching to a cloud-based one.
   - Taking into account a number of elements including immediacy, potential influence, resource availability, and alignment with strategic goals, MCDM can be used to rank the difficulties of implementing big data analytics. Especially helpful in complex projects with many stakeholders and competing priorities, this strategy provides a methodical and logical approach to decision-making.

2. **Change Management**

   - Using change management, one can find and fill skill gaps among bank staff. It can support the best possible availability and use of resources including hardware, software, and data analysis methods.
   - Formation and administration of a team require change management. It might promote alignment inside the company and enable it to train and upskill its current staff members.
   - Organisational changes brought forth by a new data analytics team can be managed with the aid of change management. This covers dealing with change aversion, encouraging an innovative and lifelong learning culture, and making sure the adjustments support the strategic goals of the company. (Seymour & Maidment, 2023)

3. **Rational Decision-Making**

A Rational Decision-making approach could be adopted to address concerns around the data security of cloud services.

- Figuring out every potential problem with cloud services and learning about the security aspects of various cloud-based services are part of the rational decision-making process. There are other options found and assessed according to how they might affect the data security appetite of the company. The best option is selected, put into practice, and its efficacy is tracked all the time.
- Decisions on data security must be made using both event-based and risk-based methods. Daily decisions must be event-based; strategic long-term investments must be risk-based. (Villadiego, 2020)

Figure 1: Strategies to address challenges.

Importance of data quality in big data analytics

"**Data is useful only when it is protected and its context, content, and quality can be trusted.**" (IBM Corporation, 2023)

How well a dataset satisfies standards for correctness, completeness, validity, consistency, uniqueness, timeliness, and fitness for purpose is known as data quality. Every effort at data governance inside a company depends on it. 2024 IBM Corporation Knowledgeable decision-making in companies depends on effective data quality standards. The possibility of negative results can be greatly increased by ignoring problems like duplicates, missing values, and outliers.

How confidently ideas may be implemented depends on the quality of the data. Poor-quality data entering analytics models may produce outcomes that are unfair, non-compliant, or erroneous.

Additionally affecting operational and analytical use cases is poor quality data. (IBM Corporation, 2023)

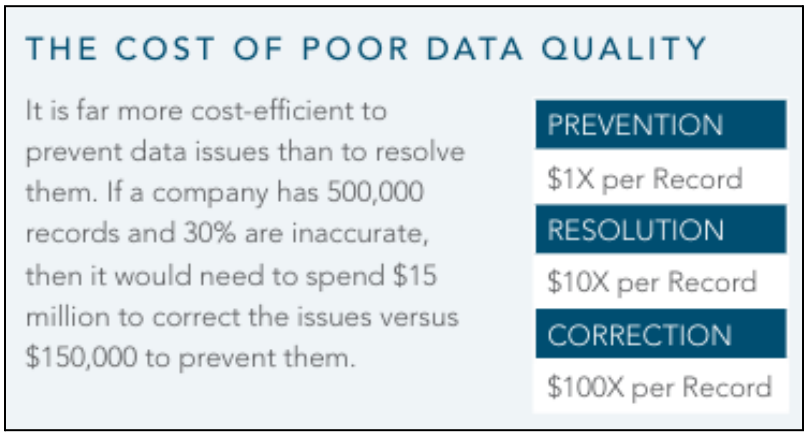


Figure 2: Cost of Poor Data Quality. (Dun & Bradstreet, 2015)

Because data has four Vs—Volume, Variety, Velocity, and Veracity—it is considered more crucial in Big Data analytics (Kumar, 2022). Big data has new properties that can present several problems for its quality, making it even more important than before. (Ghasemaghaei & Calic, 2019).

1. **Scaling Issues**: It's no longer practical to use an import-and-inspect design that works for conventional data files or spreadsheets. Data management teams need to develop big data quality practices that span traditional data warehouses and modern data lakes, and streams of real-time data. (Lawton, 2021)
2. **High Data Volume**: Big data applications are so large that it is impossible to manually evaluate new data. As such, developing automated metrics that can continuously track big data against changing applications and use cases is essential to guaranteeing data quality. (Ghasemaghaei & Calic, 2019)
3. **Complexity of data**: Because big data is so complex, it can include a broad variety of components, such as user groups, programme iterations, event types, and device categories. It takes hundreds or even thousands of segmented subsets of the data to properly identify and fix data quality problems. (Lawton, 2021)
4. Data Quality Standards ensure maximum utilisation of data and drive key benefits to an organisation especially in the era of Big Data, such as,
    a. **Improved Business Decision Making**: Users will be more confident in their outputs and run less risk with the results the higher the quality of the data. The proverb "garbage in, garbage out" is accurate as well as its reverse. And guessing

and danger in decision-making can be reduced when results are trustworthy. (Moreno, 2017)

b. **Compliance**: Maintaining high-quality data distinguishes between compliance and millions of dollars in fines in sectors like banking, where regulations control relationships or trade with specific customers (Moreno, 2017). Regulators examine banks more closely since data is essential for both the banks and the regulators to make well-informed decisions for the industry as a whole.

c. **Marketing**: Banks with high-quality customer data are better able to use that data to quickly provide tailored offers, cross-sell, and upsell. To enhance business results, banks can use high-quality data to categorise clients, analyse usage trends, and forecast churn.

d. **Increase in Customer Satisfaction**: Good data immediately affects how satisfied customers are. Trust is increased, personalisation is made possible, and services are streamlined with accurate information. Cybersecurity and risk profiling done right improve the consumer experience.

e. **Easier Implementation of Machine Learning and AI Solutions**: Among the fastest expanding sectors that use big data are machine learning and artificial intelligence. Machine learning success is mostly dependent on the quality of the data. Project evolution, resource efficiency, and model performance all increase with clean, correct data.

f. **Increased profitability and competitive advantage**: Data of the highest calibre increases profitability. It boosts sales figures and enables a company to create more successful marketing strategies. Ad waste is also reduced, which lowers the cost of marketing initiatives. (Lotame Solutions, 2019)

The benefits of Data Quality for an organisation are not limited to the above-mentioned points. It affects every business function where data is used for gathering insights.

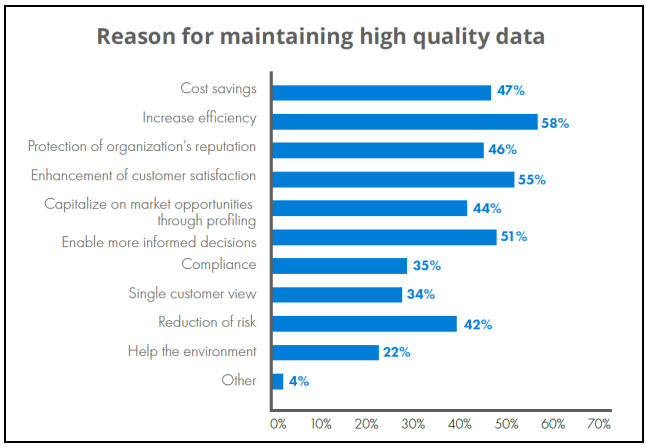


Figure 3: Reasons for maintaining High Quality Data. (Data Ladder, 2023)

Strategies to Address Data Quality Issues at BankX

Maintaining high data quality is a critical issue for BankX due to:

1. **Multiple Systems**: The bank has a variety of systems from its component organisations because of multiple mergers. Data integrity is compromised when data is transferred between these many systems because of loss and mistakes.
2. **Legacy Systems**: The bank processes and stores data on a number of antiquated systems. Data analytics would be expensive and time-consuming because data has to be thoroughly cleansed and converted into a usable format, which these systems often struggle to manage.
3. The bank stores and processes data on a number of antiquated systems. Data analytics is expensive and time-consuming since data has to be thoroughly cleansed and converted into a usable format, which these systems often struggle to manage..

Strength Weakness Opportunity Threat

Especially in the setting of Big Data Analytics, BankX may find that Strength Weakness Opportunity Threat (SWOT) analysis is a useful approach to improve its systems and identify organisational needs for Data Quality management. This approach of analysis gives a clear road map for strategic development by evaluating the internal strengths and weaknesses as well as the external opportunities and threats of a business.

Figure 4: SWOT Analysis Framework. (Learning, 2023)

1. **Strengths**:
    a. **Existing data**: BankX possesses a huge volume of customer data that could be used for gathering useful insights.
    b. **Existing infrastructure**: BankX has functionally capable systems that could be used as a solid foundation for enhancements.
2. **Weaknesses**:
    a. **Legacy systems**: Incompatible and outdated systems make data integration difficult and prone to errors.
    b. **Data quality standards**: The bank lacks uniform data quality management standards across systems.
    c. **Knowledge**: Lack of knowledge and skills among employees and unstructured knowledge management.
3. **Opportunities**:
    a. **Data Quality Software**: Advanced tools can lead to the automation of tasks such as data cleaning, standardising, and validation.
    b. **Data Integration and Migration Solutions**: Data Integration and Migration solutions can enhance the consistency of data across various systems by simplifying the data integration process.

c. **Data Governance Strategy**: Developing a robust strategy that defines clear data stewardship, responsibility, and protocols can greatly elevate the standard of data quality management.

4. **Threats**:
    a. **Regulatory Compliance**: Inadequate data quality may cause violations of data protection laws, potentially incurring penalties and harming the bank's reputation.
    b. **Competitive Edge**: Subpar data quality impairs strategic decision-making, placing BankX at a competitive shortfall against rivals who utilise precise data for enhanced analytics.
    c. **Implementation Costs and Resources**: Implementing a company-wide Data Quality Framework would require huge investments and management overhaul.

Based on the SWOT Analysis, BankX could implement the following measures for solving its Data Quality issues:

1. **Data Quality Framework for Data Migration**: The following action plan could help BankX ensure high data quality while migrating data from the legacy systems using the ETL process: (Data Ladder, 2023.)
    a. Safe extraction of the data from the legacy systems should be done after backups.
    b. It should be possible to map the data to the new system accurately. Previous data has to be cleaned and duplicate, unstructured, and incomplete data removed before mapping or switching to a new system.
    c. Bringing a sample into the new system should validate the data. This makes sure that the features of the new system are followed while standardising the old data.
2. **Data Quality Rules**: By providing a solid framework for data management and integrity assurance, data quality standards can greatly help overcome data quality problems. Ensuring data uniqueness, validity, accuracy, completeness, consistency, timeliness, and relational integrity should be the main goals of data quality rules.
3. **Automating Data Lineage**: From the moment of capture or origination to consumption by an end user or application, data lineage records how data moves throughout the organisation, frequently noting the alterations made along the route. Ho and associates 2020 A laborious task, documenting data lineage runs the danger of overengineering. BankX should concentrate on using machine learning based solutions for system integration and auto discovery in order to automate data lining.

4. **Data Governance Framework**: Adopting a Data Governance Framework by the bank should contain data usage policies, security and legal observance.
5. **Training and Knowledge Management**: BankX ought to educate its employees on the value of data quality and how to use the latest cloud-based applications and platforms. One should put in place a good knowledge management system that records the information from Subject Matter Experts. The management ought to promote a culture of data quality consciousness throughout the company as well.
6. **Monitoring**: BankX ought to make use of real-time data monitoring tools like the Data Quality Dashboard. There should be implementation of monitoring software that sounds an alert for any anomalies or departures from the set data quality standards.

Group Decision Support Systems

Adopting Group Decision Support Systems (GDSS) at the managerial and strategic levels could be essential to creating and putting into practice a Data Quality managerial-focused corporate culture. Combining computer, decision, and communication technologies, a group decision support system (GDSS) facilitates group decision making, problem solving, and follow-up tasks. (Poole & Ahmed, 2009)

- **Structured Dialogue**: GDSS structures data quality discussions, enabling collective problem-solving.
- **Information Sharing**: It ensures equal access to data quality information for all participants.
- **Consensus Building**: GDSS aids in reaching an agreement on data quality solutions through anonymous voting.

Task B

1a)

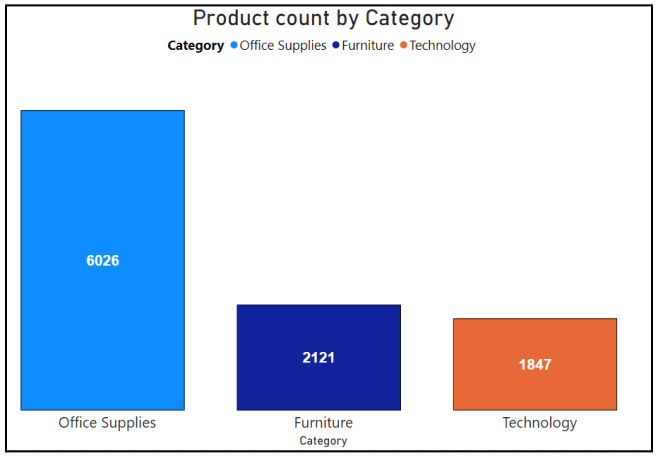


Figure 5: Product Count in each Category.

Office Supplies was the category with the most products at 6,026 and 226.26% more than Technology, which had the fewest products at 1,847.Office supplies has the most products, followed by furniture at 2,121 and technology at 1,847, in that order. Sixty-three percent of the products in the count were office supplies.

1b)

Top 10 Products by Sales

Product Name	Sales ($)
Canon imageCLASS 2200 Advanced Copier	61,599.82
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind	27,453.38
Cisco TelePresence System EX90 Videoconferencing Unit	22,638.48
HON 5400 Series Task Chairs for Big and Tall	21,870.58
GBC DocuBind TL300 Electric Binding System	19,823.48
GBC Ibimaster 500 Manual ProClick Binding System	19,024.50
Hewlett Packard LaserJet 3310 Copier	18,839.69
HP Designjet T520 Inkjet Large Format Printer - 24" Color	18,374.90
GBC DocuBind P400 Electric Binding System	17,965.07
High Speed Automatic Electric Letter Opener	17,030.31

Bottom 10 Products by Sales

Product Name	Sales ($)
Newell 308	8.40
Stockwell Gold Paper Clips	8.10
4009 Highlighters	8.04
Xerox 1989	7.97
Avery Hi-Liter Comfort Grip Fluorescent Highlighter, Yellow Ink	7.80
Avery Hi-Liter Pen Style Six-Color Fluorescent Set	7.70
Grip Seal Envelopes	7.07
Xerox 20	6.48
Avery 5	5.76
Eureka Disposable Bags for Sanitaire Vibra Groomer I Upright Vac	1.62

Figure 6: Top 10 and Bottom 10 Products.

1c)

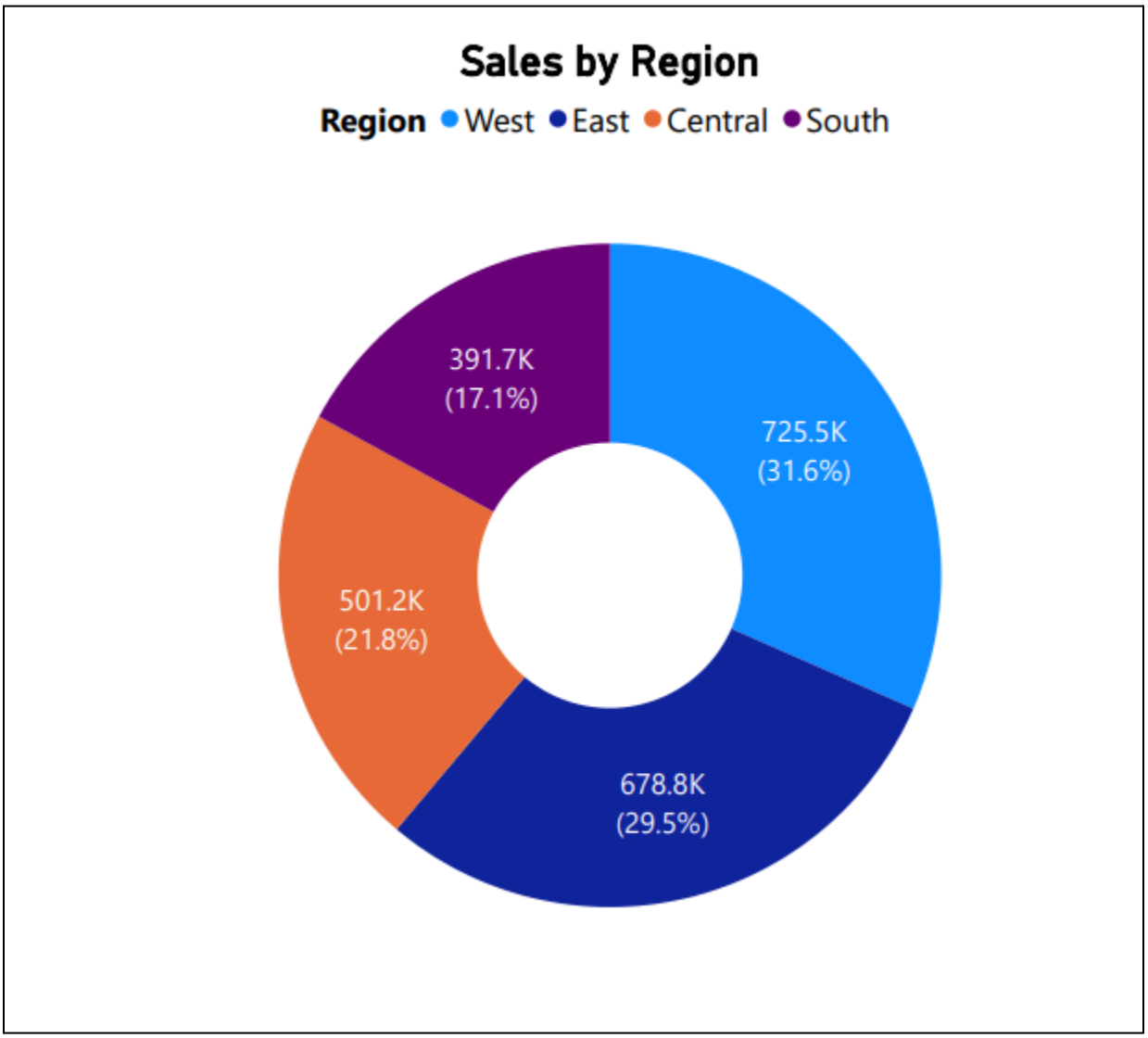


Figure 7: Sales performance.

The West region accounts for the highest sales followed by East, Central, and South. 31.58% of the total sales came from the West.

1d)

Central | East | South | West

Top 10 Products by Sales

Product Name	Sales ($)
Canon imageCLASS 2200 Advanced Copier	17,499.95
Lexmark MX611dhe Monochrome Laser Printer	14,279.92
Ibico EPK-21 Electric Binding System	11,339.94
GBC Ibimaster 500 Manual ProClick Binding System	10,653.72
GBC DocuBind P400 Electric Binding System	8,710.34
HON 5400 Series Task Chairs for Big and Tall	6,939.70
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind	6,100.75
Canon PC1060 Personal Laser Copier	4,899.93
Mitel MiVoice 5330e IP Phone	4,179.85
Martin Yale Chadless Opener Electric Letter Opener	4,164.05

Bottom 10 Products by Sales

Product Name	Sales ($)
Master Caster Door Stop, Gray	2.03
Tuff Stuff Recycled Round Ring Binders	1.93
C-Line Cubicle Keepers Polyproplyene Holder With Velcro Backings	1.89
Acco Suede Grain Vinyl Round Ring Binder	1.67
Eureka Disposable Bags for Sanitaire Vibra Groomer I Upright Vac	1.62
Hoover Commercial Lightweight Upright Vacuum	1.39
Zipper Ring Binder Pockets	1.25
Acco Economy Flexible Poly Round Ring Binder	1.04
Avery Durable Slant Ring Binders With Label Holder	0.84
Hoover Replacement Belt for Commercial Guardsman Heavy-Duty Upright Vacuum	0.44

Central | East | South | West

Top 10 Products by Sales

Product Name	Sales ($)
Canon imageCLASS 2200 Advanced Copier	30,099.91
3D Systems Cube Printer, 2nd Generation, Magenta	14,299.89
Riverside Palais Royal Lawyers Bookcase, Royale Cherry Finish	11,717.03
GBC DocuBind TL300 Electric Binding System	8,790.50
Hewlett Packard LaserJet 3310 Copier	8,639.86
HON 5400 Series Task Chairs for Big and Tall	8,201.47
Apple iPhone 5	7,797.96
Ativa V4110MDD Micro-Cut Shredder	7,699.89
DMI Eclipse Executive Suite Bookcases	7,214.11
HP Designjet T520 Inkjet Large Format Printer - 24" Color	6,999.96

Bottom 10 Products by Sales

Product Name	Sales ($)
Economy Binders	3.33
Avery Durable Poly Binders	3.32
Avery 491	3.30
Heavy-Duty E-Z-D Binders	3.27
Self-Adhesive Ring Binder Labels	3.17
Brites Rubber Bands, 1 1/2 oz. Box	3.17
Maxell 4.7GB DVD+R 5/Pack	2.97
Design Ebony Sketching Pencil	2.78
Binney & Smith Crayola Metallic Crayons, 16-Color Pack	2.70
OIC Binder Clips, Mini, 1/4" Capacity, Black	1.24

Central | East | South | West

Top 10 Products by Sales

Product Name	Sales ($)
Cisco TelePresence System EX90 Videoconferencing Unit	22,638.48
HP Designjet T520 Inkjet Large Format Printer - 24" Color	11,374.94
GBC DocuBind TL300 Electric Binding System	8,342.01
Cubify CubeX 3D Printer Triple Head Print	7,999.98
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind	7,625.94
Samsung Galaxy Mega 6.3	7,307.83
Chromcraft Bull-Nose Wood Oval Conference Tables & Bases	6,611.76
Martin Yale Chadless Opener Electric Letter Opener	5,829.67
Tennsco Double-Tier Lockers	5,355.48
Samsung Galaxy S4 Active	3,499.93

Bottom 10 Products by Sales

Product Name	Sales ($)
SANFORD Liquid Accent Tank-Style Highlighters	2.84
Eldon Regeneration Recycled Desk Accessories, Smoke	2.78
Wilson Jones Suede Grain Vinyl Binders	2.78
Newell 3-Hole Punched Plastic Slotted Magazine Holders for Binders	2.74
Avery 479	2.61
Wilson Jones data.warehouse D-Ring Binders with DublLock	2.47
Maxell 4.7GB DVD+R 5/Pack	2.38
OIC Binder Clips, Mini, 1/4" Capacity, Black	1.98
Maxell 4.7GB DVD-R 5/Pack	1.58
Prang Dustless Chalk Sticks	1.34

Central | East | South | West

Top 10 Products by Sales

Product Name	Sales ($)
Canon imageCLASS 2200 Advanced Copier	13,999.96
High Speed Automatic Electric Letter Opener	13,100.24
Global Troy Executive Leather Low-Back Tilter	10,019.60
Fellowes PB500 Electric Punch Plastic Comb Binding Machine with Manual Bind	8,134.34
GuestStacker Chair with Chrome Finish Legs	8,030.02
Okidata MB760 Printer	7,834.40
Bretford Rectangular Conference Table Tops	7,710.67
Logitech P710e Mobile Speakerphone	7,467.21
Canon PC1060 Personal Laser Copier	6,719.90
Hewlett Packard LaserJet 3310 Copier	6,239.90

Bottom 10 Products by Sales

Product Name	Sales ($)
Sterling Rubber Bands by Alliance	4.71
Avery Round Ring Poly Binders	4.54
Acco Economy Flexible Poly Round Ring Binder	4.18
Design Ebony Sketching Pencil	4.17
Avery 510	3.75
Avery 511	3.08
Bagged Rubber Bands	3.02
Acco Banker's Clasps, 5 3/4"-Long	2.88
Wilson Jones DublLock D-Ring Binders	2.03
Colored Push Pins	1.81

Figure 8: Top 10 and Bottom 10 in each Region.

1e)

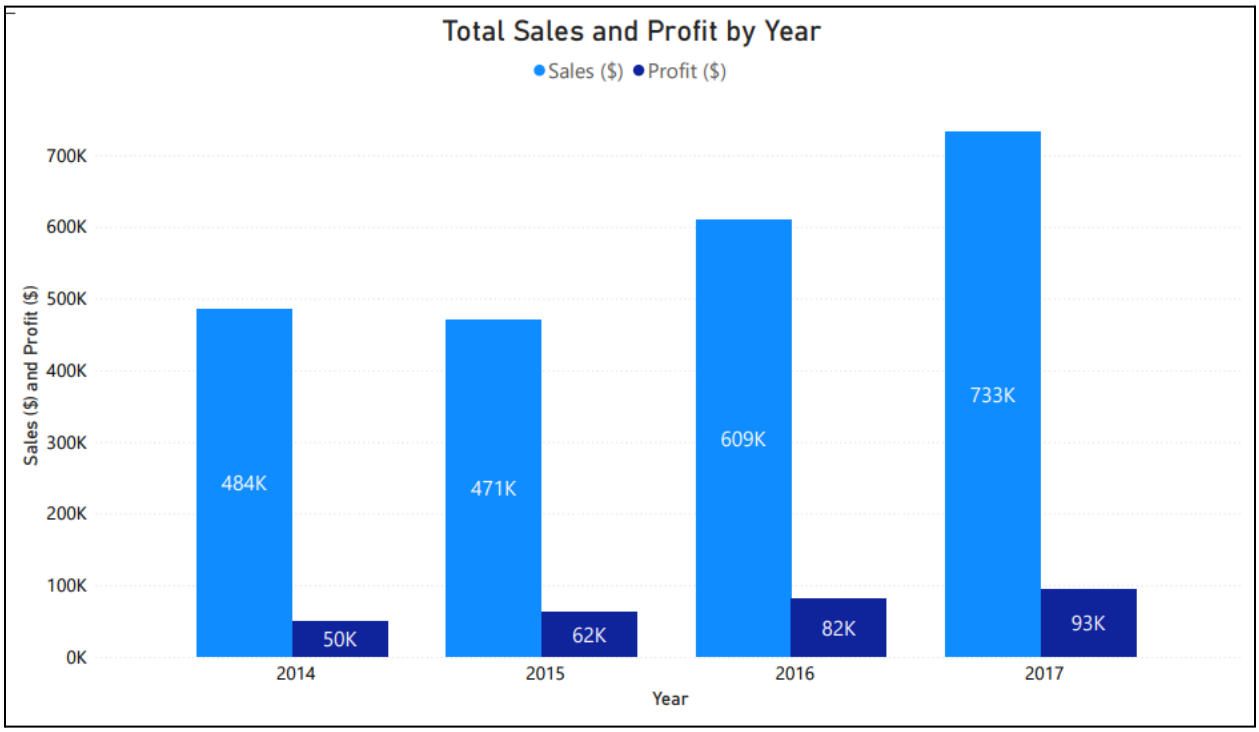


Figure 9: Total Sales and Profit over Year.

From 2014 - 2017, the graph shows an increasing tendency. Since sales increased in 2016 - 2017, profit increased in the same period, it seems that higher sales are generating higher profits. There is a more noticeable increase in profit between 2015 - 2016 and between 2016 - 2017. There is considerable increase in sales between 2015 - 2016 and 2016 and 2017.

Over the period, Alpha Stores has shown an increase in both sales and profit. Profit and sales growth that is constant shows good business plans and market success. The general increasing trend was not much impacted by the sales decline in 2015 because both measures indicate strong rises in the years that followed.

2a)

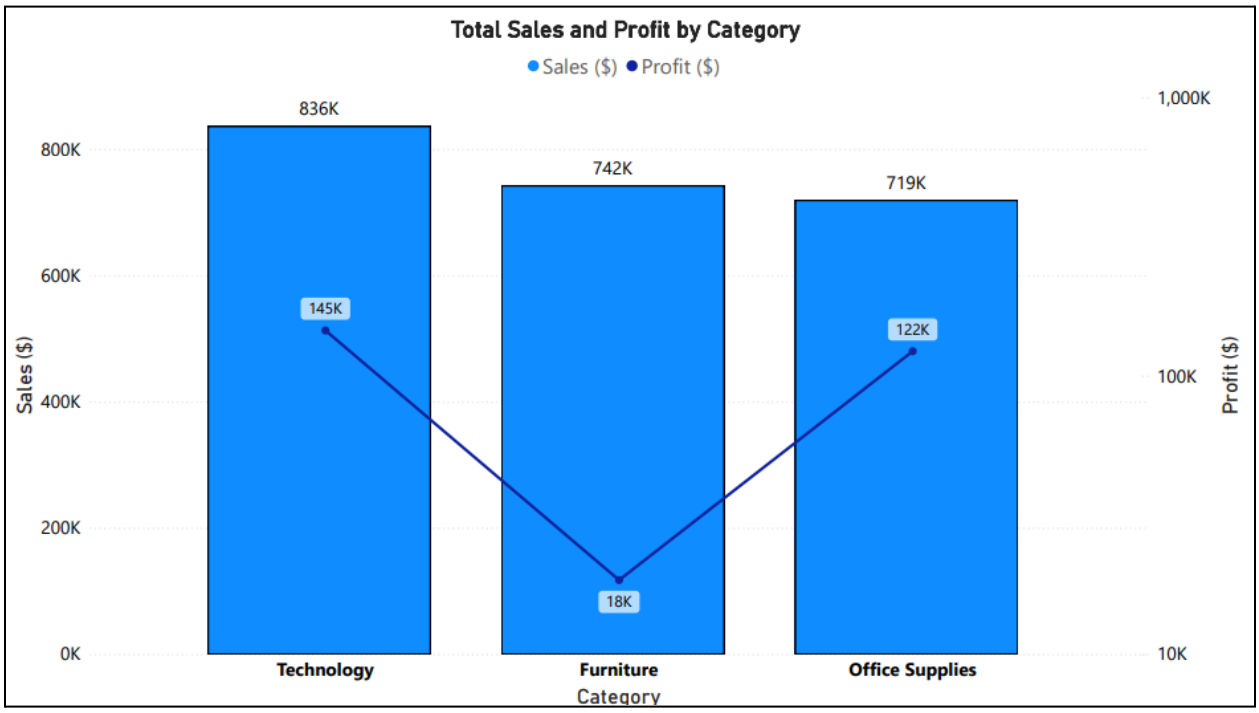


Figure 10: Product Category, Sales and Profit.

Technology generates the most sales and profit in absolute terms, the study suggests that it might not be the most profitable sector in terms of profit margins. Office supplies have the lowest sales, they might be a more lucrative industry with higher profit margins. Furniture looks to be the least profitable category.

2b)

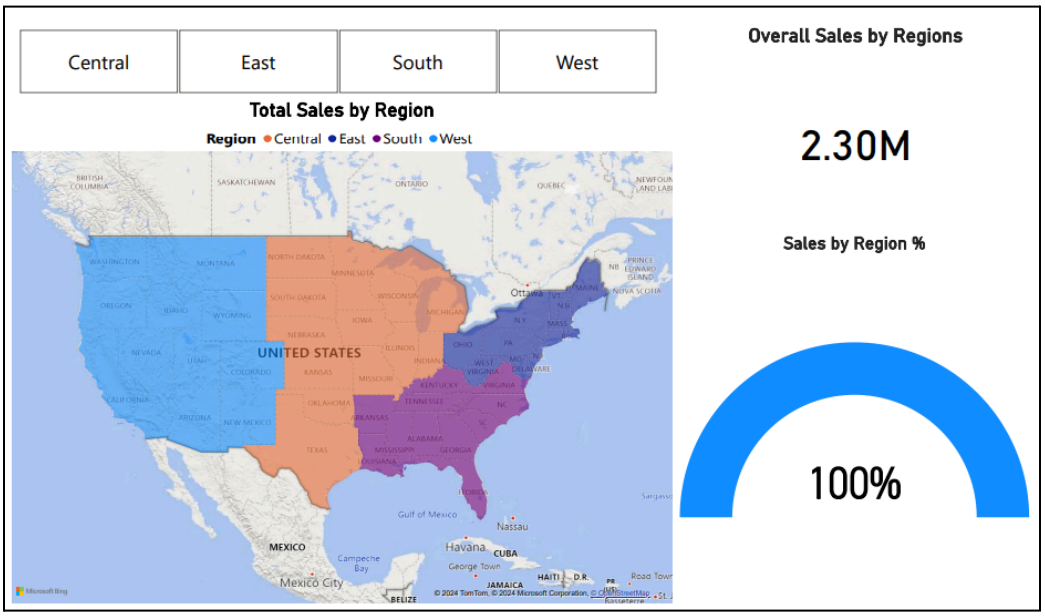


Figure 11: Total Sales in each Region.

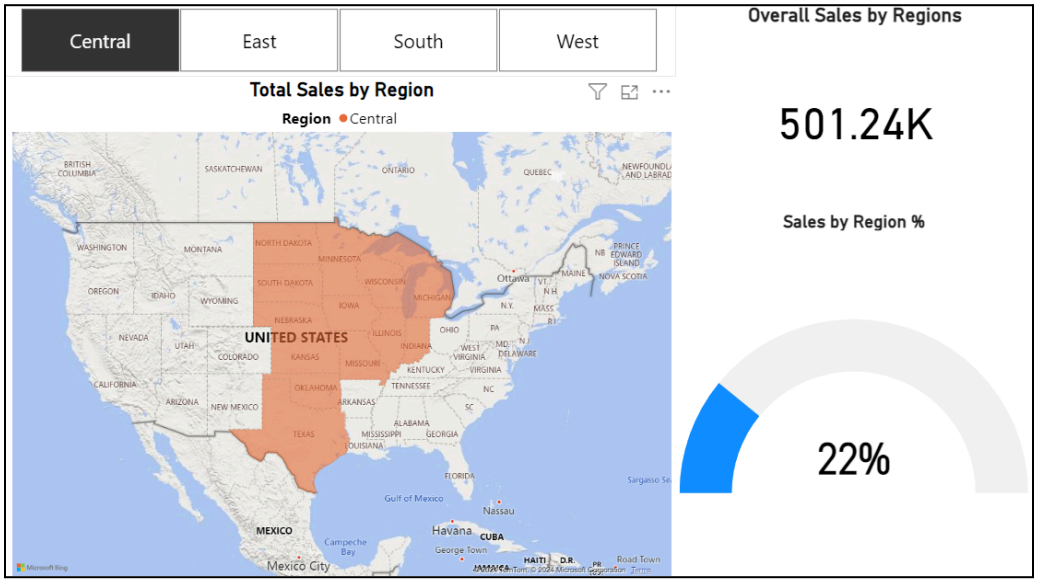


Figure 12: Total Sales in the Central Region.

The West Region has the highest overall sales. This could suggest a strong market presence or maybe more substantial economic activity in this region due to higher population density and the presence of more companies compared to Central and South regions. The East appears to be a significant contributor too. Lower sales in the Central and South regions as opposed to the West and East may suggest that these regions need better marketing plans, product offers, or sales campaigns.

2c)

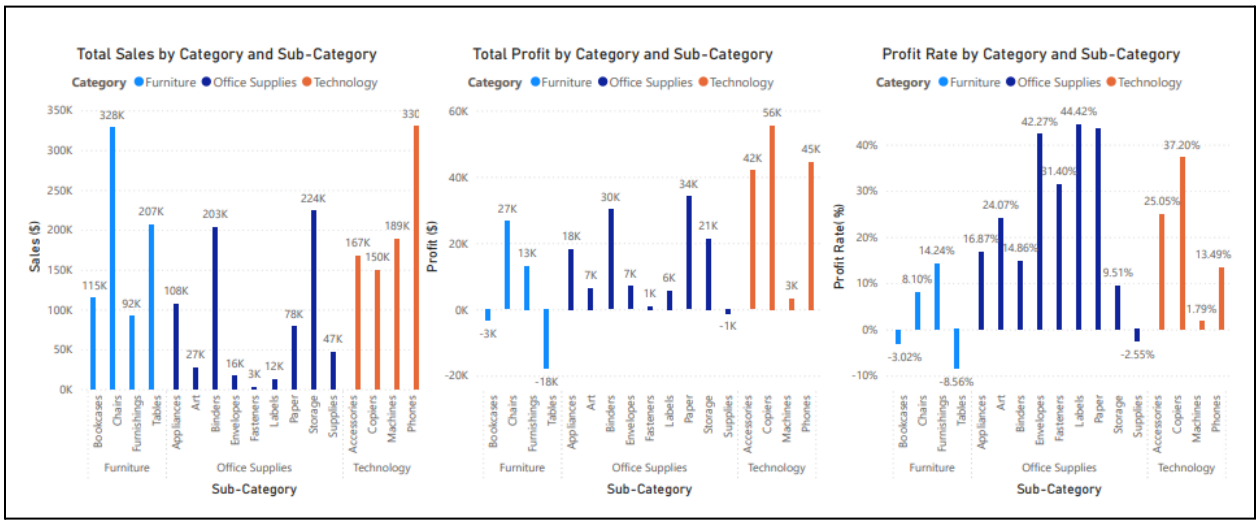


Figure 13: Sales, Profit and Profit rate in each Category and Sub-category.

Many machines are sold in the Technology category and they don't make profit. This suggests that saving costs or enhancing pricing techniques are possible. Though there are a lot of tables sold in the Furniture category, they are losing money, which means that expenses must be assessed or pricing must be adjusted. Copiers and phones are examples of technology items that are strong performers in both areas since they not only produce large sales but also large profits. The remarkable profit margins seen in the office supplies sector on labels and envelopes point to a high degree of profitability in these particular market niches.

2d)

Central	East	South	West

03/01/2014 30/12/2017

Product Performance by Category and Customer Segment

Category	Sub-Category	Consumer	Corporate	Home Office	Total $
Technology	Phones	169,932.76	91,153.41	68,920.88	**330,007.05**
	Machines	79,542.83	60,276.75	49,419.05	**189,238.63**
	Accessories	87,105.24	48,190.56	32,084.52	**167,380.32**
	Copiers	69,819.07	46,829.39	32,879.57	**149,528.03**
	Total $	**406,399.90**	**246,450.12**	**183,304.02**	**836,154.03**
Furniture	Chairs	172,862.74	99,140.88	56,445.48	**328,449.10**
	Tables	99,933.80	70,871.72	36,160.02	**206,965.53**
	Bookcases	68,632.73	34,005.92	12,241.34	**114,880.00**
	Furnishings	49,620.05	25,001.27	17,083.85	**91,705.16**
	Total $	**391,049.31**	**229,019.79**	**121,930.70**	**741,999.80**
Office Supplies	Storage	100,492.40	79,791.00	43,560.21	**223,843.61**
	Binders	118,161.01	51,560.31	33,691.41	**203,412.73**
	Appliances	52,819.58	36,588.68	18,123.90	**107,532.16**
	Paper	36,324.37	23,883.13	18,271.71	**78,479.21**
	Supplies	25,741.50	19,435.28	1,496.76	**46,673.54**
	Art	14,251.93	8,590.45	4,276.41	**27,118.79**
	Envelopes	7,771.15	5,942.67	2,762.59	**16,476.40**
	Labels	6,709.26	4,101.65	1,675.40	**12,486.31**
	Fasteners	1,680.94	783.29	560.05	**3,024.28**
	Total $	**363,952.14**	**230,676.46**	**124,418.43**	**719,047.03**
Total $		**1,161,401.35**	**706,146.37**	**429,653.15**	**2,297,200.86**

Back to report

PRODUCT PERFORMANCE BY CATEGORY AND CUSTOMER SEGMENT

Category	Consumer	Corporate	Home Office	Total $
Technology	**4,06,399.90**	**2,46,450.12**	**1,83,304.02**	**8,36,154.03**
Phones	**1,69,932.76**	**91,153.41**	**68,920.88**	**3,30,007.05**
Samsung Galaxy Mega 6.3	10,247.76		3,695.91	**13,943.67**
Apple iPhone 5	6,628.27	1,039.73	5,328.61	**12,996.60**
Wilson Electronics DB Pro Signal Booster	2,434.40	4,439.20	2,004.80	**8,878.40**
Mitel MiVoice 5330e IP Phone	3,904.86	2,474.91	1,319.95	**7,699.72**
Samsung Galaxy S III - 16GB - pebble blue (T-Mobile)	3,149.91	3,989.89		**7,139.80**
Cisco Unified IP Phone 7945G VoIP phone	4,842.06		1,909.54	**6,751.60**
ClearOne CHATAttach 160 - speaker phone	4,463.93	1,487.98	743.99	**6,695.89**
Polycom VVX 310 VoIP phone	3,167.82	1,619.91	1,439.92	**6,227.65**
Samsung Galaxy S4	5,133.12		1,001.58	**6,134.70**
Samsung Galaxy S4 Mini	2,631.94	469.99	3,007.94	**6,109.87**
Wilson SignalBoost 841262 DB PRO Amplifier Kit	3,239.55	575.92	1,511.79	**5,327.26**
GE 30524EE4	2,939.85	1,332.73	1,019.15	**5,291.73**
Panasonic KX-TG9471B	3,214.24	1,763.91		**4,978.15**
Apple iPhone 5S	4,331.92	569.99		**4,901.91**
Polycom CX600 IP Phone VoIP phone	479.92	539.91	3,599.40	**4,619.23**
Samsung Galaxy Note 2		4,507.90		**4,507.90**
Nortel Meridian M3904 Professional Digital phone	3,264.59	1,170.32		**4,434.91**
Motorola L703CM	1,996.67	1,715.89	499.17	**4,211.73**
Cisco SPA301	2,963.81	374.38	842.35	**4,180.53**
Wireless Extenders zBoost YX545 SOHO Signal Booster	1,474.12	1,360.73	1,209.54	**4,044.39**
Samsung Galaxy S4 Active		3,999.92		**3,999.92**
Polycom SoundStation2 EX Conference phone	3,968.51			**3,968.51**
Polycom SoundPoint IP 450 VoIP phone	813.10	3,026.52		**3,839.62**
Google Nexus 5	1,295.93	1,979.89	539.97	**3,815.79**
Aastra 57i VoIP phone	2,779.69	420.19	484.83	**3,684.71**
Total $	**11,61,401.35**	**7,06,146.37**	**4,29,653.15**	**22,97,200.86**

Figure 14: Product performance.

The largest overall sales is in Technology in the Corporate and Consumer markets. For the Office Supplies notable sales, particularly in the Consumer and Corporate markets. Strong performance in the consumer and corporate markets in the Furniture.

2e)

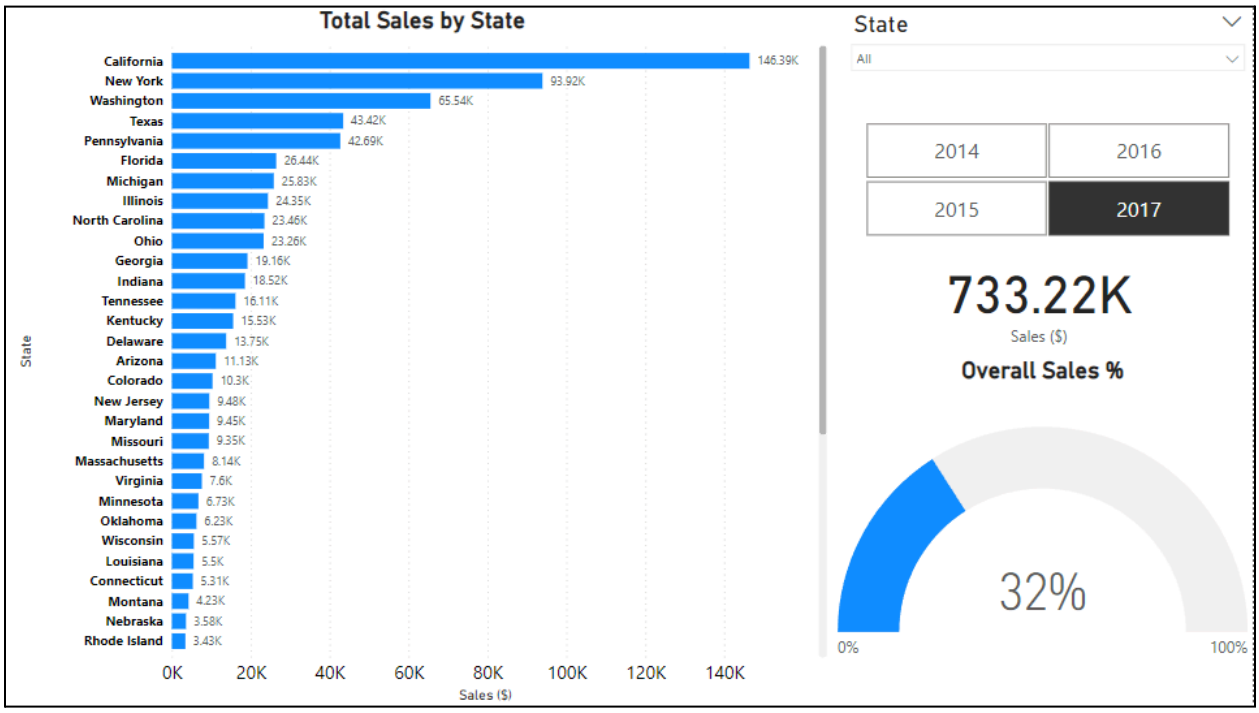


Figure 15: State contribution to Sales in 2017.

California having the largest sales, plans should concentrate on preserving and growing market dominance by means of focused marketing, promotions, and client interaction. Strong performers are the states of New York and Washington. Investments in these markets going forward can pay you handsomely. Florida, Michigan, Illinois, and North Carolina states have moderate sales but have room to develop. Localised advertising and tailored marketing plans could be able to unlock this potential. States with lower sales numbers offer chances for expansion. Competitive analysis, focused promotions, and market research to comprehend regional preferences could all assist boost sales in these areas. The state Wyoming though listed, the 2017 sales figures did not include it. To grasp the market dynamics or the data accuracy for this state, this anomaly has to be looked at.

2f)

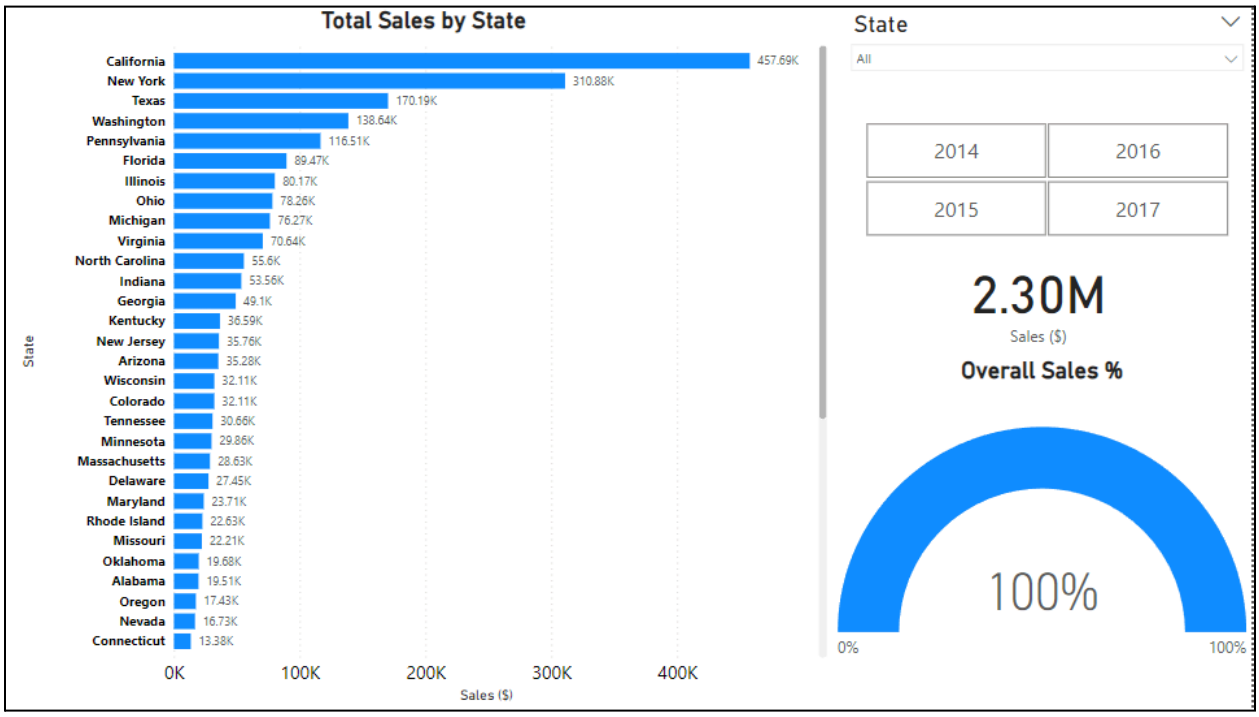
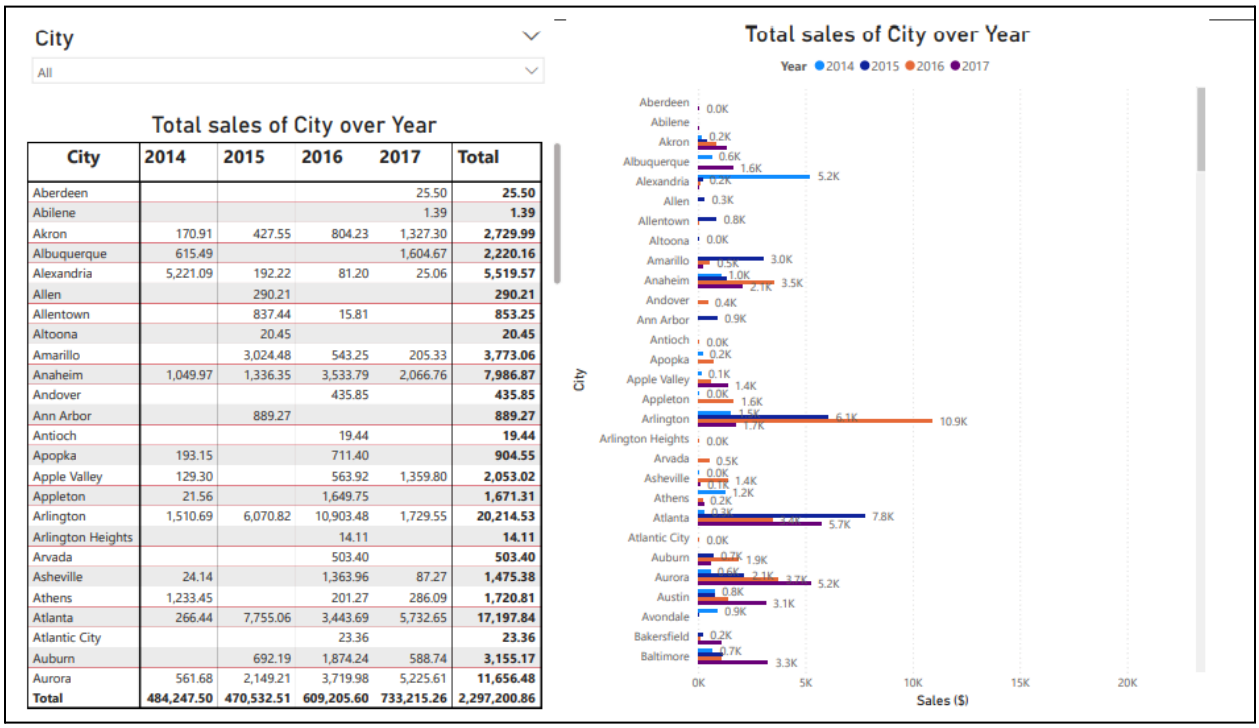


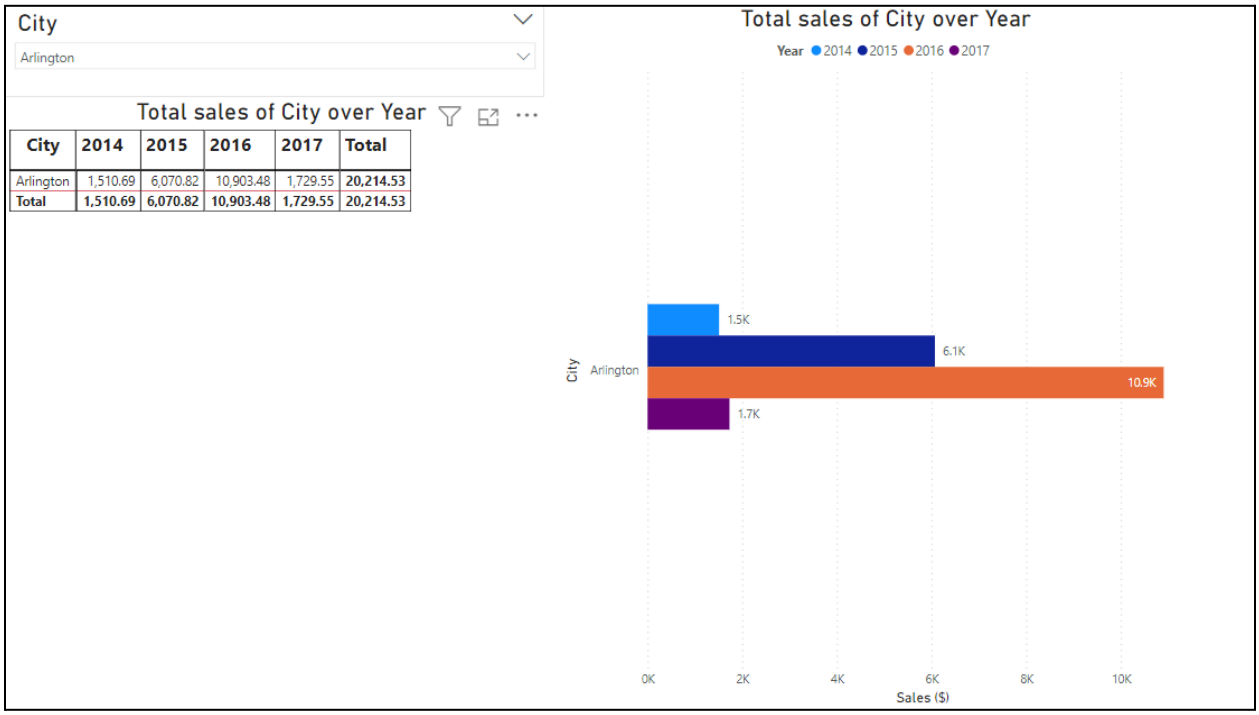
Figure 16: State contribution to Sales.

California leads the market share and shows a high demand by contributing the largest proportion to overall sales. States that contribute somewhat to overall sales are Pennsylvania, Florida, Illinois, Ohio, Michigan, and Virginia. Important markets, these states have consistent sales figures and potential for further market penetration. This group also includes North Carolina, Indiana, Georgia, Kentucky, and New Jersey, indicating that these are dependable markets that might profit from focused marketing initiatives. Less of the total sales are contributed by states including Delaware, Arizona, Wisconsin, Colorado, Tennessee, Massachusetts, Maryland, and Rhode Island. Although these states contribute less, they provide chances for expansion by means of tailored sales and marketing plans.

2g)



City	2014	2015	2016	2017	Total
Aberdeen				25.50	**25.50**
Abilene				1.39	**1.39**
Akron	170.91	427.55	804.23	1,327.30	**2,729.99**
Albuquerque	615.49			1,604.67	**2,220.16**
Alexandria	5,221.09	192.22	81.20	25.06	**5,519.57**
Allen		290.21			**290.21**
Allentown		837.44	15.81		**853.25**
Altoona		20.45			**20.45**
Amarillo		3,024.48	543.25	205.33	**3,773.06**
Anaheim	1,049.97	1,336.35	3,533.79	2,066.76	**7,986.87**
Andover			435.85		**435.85**
Ann Arbor		889.27			**889.27**
Antioch			19.44		**19.44**
Apopka	193.15		711.40		**904.55**
Apple Valley	129.30		563.92	1,359.80	**2,053.02**
Appleton	21.56		1,649.75		**1,671.31**
Arlington	1,510.69	6,070.82	10,903.48	1,729.55	**20,214.53**
Arlington Heights			14.11		**14.11**
Arvada			503.40		**503.40**
Asheville	24.14		1,363.96	87.27	**1,475.38**
Athens	1,233.45		201.27	286.09	**1,720.81**
Atlanta	266.44	7,755.06	3,443.69	5,732.65	**17,197.84**
Atlantic City			23.36		**23.36**
Auburn		692.19	1,874.24	588.74	**3,155.17**
Aurora	561.68	2,149.21	3,719.98	5,225.61	**11,656.48**
Total	**484,247.50**	**470,532.51**	**609,205.60**	**733,215.26**	**2,297,200.86**



City	2014	2015	2016	2017	Total
Arlington	1,510.69	6,070.82	10,903.48	1,729.55	**20,214.53**
Total	**1,510.69**	**6,070.82**	**10,903.48**	**1,729.55**	**20,214.53**

Figure 17: Sales comparison across cities.

Sales at Akron increased steadily between 2014 and 2017, suggesting a rising market presence. The city of Albuquerque although there haven't been any sales for a few years, 2017 numbers indicate focused

sales attempts. In Alexandria sales were highest in 2014 and then fell, suggesting that the market or competition may have changed. Big year-over-year differences in sales in some locations, such as Yonkers and Alexandria, point to either project-based sales or noteworthy shifts in market demand. Sales showing in later years in cities like Yuma and Aberdeen point to recent expansion initiatives or new market entrances. New York's sales figures in 2016 and 2017 indicate potential for a developing market, with no sales in 2014 or 2015. Years of no sales in several cities indicate inconsistent market presence or low demand. Just two are Woonsocket and Yucaipa.

2h)

2014 | 2015 | 2016 | 2017

Product Name: All | Category: All | Sub-Category: All

28.66
Average Profit/Quantity($)

Total Sales and Quantity sold by Category and Segment

Segment	Consumer			Corporate			Home Office			Total		
Category	Quantity	Sales	Profit	Quantity	Sales	Profit	Quantity	Sales	Profit	Quantity	Sales	Profit
Furniture	**1113**	**3,91,049.31**	**6,991.08**	**646**	**2,29,019.79**	**7,584.82**	**362**	**1,21,930.70**	**3,875.38**	**2121**	**7,41,999.80**	**18,451.27**
Bookcases	131	68,632.73	-4,435.64	64	34,005.92	638.45	33	12,241.34	324.63	**228**	**1,14,880.00**	**-3,472.56**
Chairs	329	1,72,862.74	13,235.33	188	99,140.88	8,344.66	100	56,445.48	5,010.18	**617**	**3,28,449.10**	**26,590.17**
Furnishings	494	49,620.05	7,919.42	288	25,001.27	3,508.21	175	17,083.85	1,631.51	**957**	**91,705.16**	**13,059.14**
Tables	159	99,933.80	-9,728.04	106	70,871.72	-4,906.50	54	36,160.02	-3,090.94	**319**	**2,06,965.53**	**-17,725.48**
Office Supplies	**3127**	**3,63,952.14**	**56,330.32**	**1820**	**2,30,676.46**	**40,227.32**	**1079**	**1,24,418.43**	**25,933.16**	**6026**	**7,19,047.03**	**1,22,490.80**
Appliances	244	52,819.58	6,981.93	155	36,588.68	7,429.90	67	18,123.90	3,726.18	**466**	**1,07,532.16**	**18,138.01**
Art	428	14,251.93	3,454.30	218	8,590.45	2,004.65	150	4,276.41	1,068.84	**796**	**27,118.79**	**6,527.79**
Binders	780	1,18,161.01	17,995.60	473	51,560.31	6,377.32	270	33,691.41	5,848.85	**1523**	**2,03,412.73**	**30,221.76**
Envelopes	129	7,771.15	3,264.41	84	5,942.67	2,571.23	41	2,762.59	1,128.54	**254**	**16,476.40**	**6,964.18**
Fasteners	114	1,680.94	576.80	59	783.29	251.90	44	560.05	120.81	**217**	**3,024.28**	**949.52**
Labels	189	6,709.26	3,075.99	102	4,101.65	1,760.83	73	1,675.40	709.44	**364**	**12,486.31**	**5,546.25**
Paper	693	36,324.37	15,534.64	408	23,883.13	10,361.55	269	18,271.71	8,157.38	**1370**	**78,479.21**	**34,053.57**
Storage	450	1,00,492.40	7,104.20	260	79,791.00	9,131.02	136	43,560.21	5,043.60	**846**	**2,23,843.61**	**21,278.83**
Supplies	100	25,741.50	-1,657.55	61	19,435.28	338.93	29	1,496.76	129.53	**190**	**46,673.54**	**-1,189.10**
Technology	**951**	**4,06,399.90**	**70,797.81**	**554**	**2,46,450.12**	**44,167.00**	**342**	**1,83,304.02**	**30,490.14**	**1847**	**8,36,154.03**	**1,45,454.95**
Accessories	408	87,105.24	20,735.92	227	48,190.56	12,707.48	140	32,084.52	8,493.23	**775**	**1,67,380.32**	**41,936.64**
Copiers	35	69,819.07	24,083.71	20	46,829.39	18,990.28	13	32,879.57	12,543.84	**68**	**1,49,528.03**	**55,617.82**
Machines	57	79,542.83	2,141.06	35	60,276.75	703.02	23	49,419.05	540.68	**115**	**1,89,238.63**	**3,384.76**
Phones	451	1,69,932.76	23,837.11	272	91,153.41	11,766.22	166	68,920.88	8,912.40	**889**	**3,30,007.05**	**44,515.73**
Total	**5191**	**11,61,401.35**	**1,34,119.21**	**3020**	**7,06,146.37**	**91,979.13**	**1783**	**4,29,653.15**	**60,298.68**	**9994**	**22,97,200.86**	**2,86,397.02**

Figure 18: Product vs Quantity sold.

The most common category, according to the table, is Office Supplies, followed by Furniture and Technology. Higher profit margins are indicated, nonetheless, by Furniture producing the highest overall profit. Sales trends vary throughout categories; consumers prefer chairs, corporate prefers binders, and home offices prefer paper. Remarkably, certain categories, such as Bookcases and Tables, lose members. More precise information on the leaders and underachievers in each category would come from a closer examination of individual product sales.

2i)

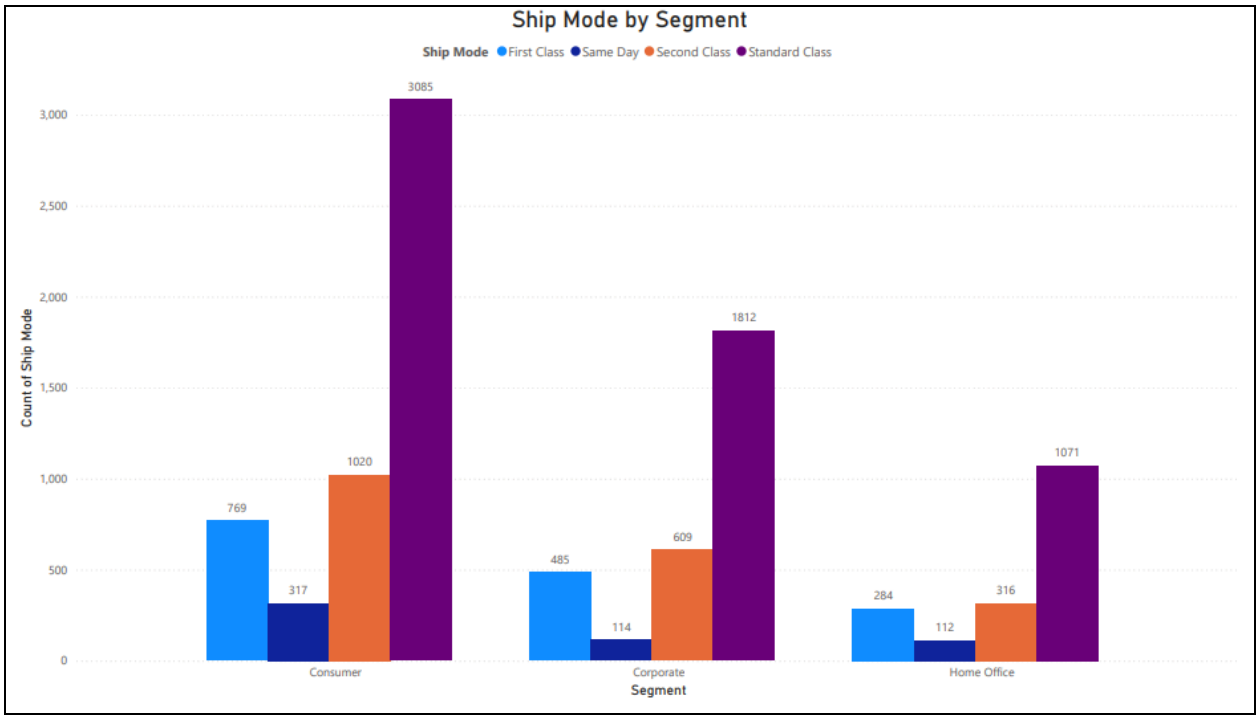


Figure 19: Shipping mode vs Customer segment.

Standard Class has the largest sales and volume of any delivery method among all client groups. This suggests that for the most part, buyers value economy over speed. The Consumer Segment prefers Standard and Second Class shipping, consumers have the highest sales and volume across all shipping modes. Accordingly, customers are more price conscious and prepared to wait longer for deliveries. The Corporate Segment, still largely using Standard and Second Class, corporations choose quicker shipping options like First Class and Same Day over Home Office clients. Customers of Home Offices exhibit a balanced choice of shipping methods, slanting somewhat in favour of less expensive choices like Standard and Second Class. First Class and Same Day Shipping shipping alternatives are likely used by consumers that need urgent delivery or are buying higher-value products because, although having smaller quantities, they produce substantial sales.

2j)

Figure 20: Product Category, Sales and Discount.

The Office Supplies is the group with the lowest overall sales but the biggest average discount. This can point to consumer price sensitivity or competitive market conditions necessitating regular discounts. Furniture strikes a mix between ordinary savings and significant deals. Higher sales volumes could be greatly aided by discounts. Technology has the lowest average discounts matched by its highest sales, indicating that consumers value technology products highly and are less affected by discounting tactics.

The peaks in the sales during the months of March, June, September, November and December could be due the holiday seasons present.

3a)

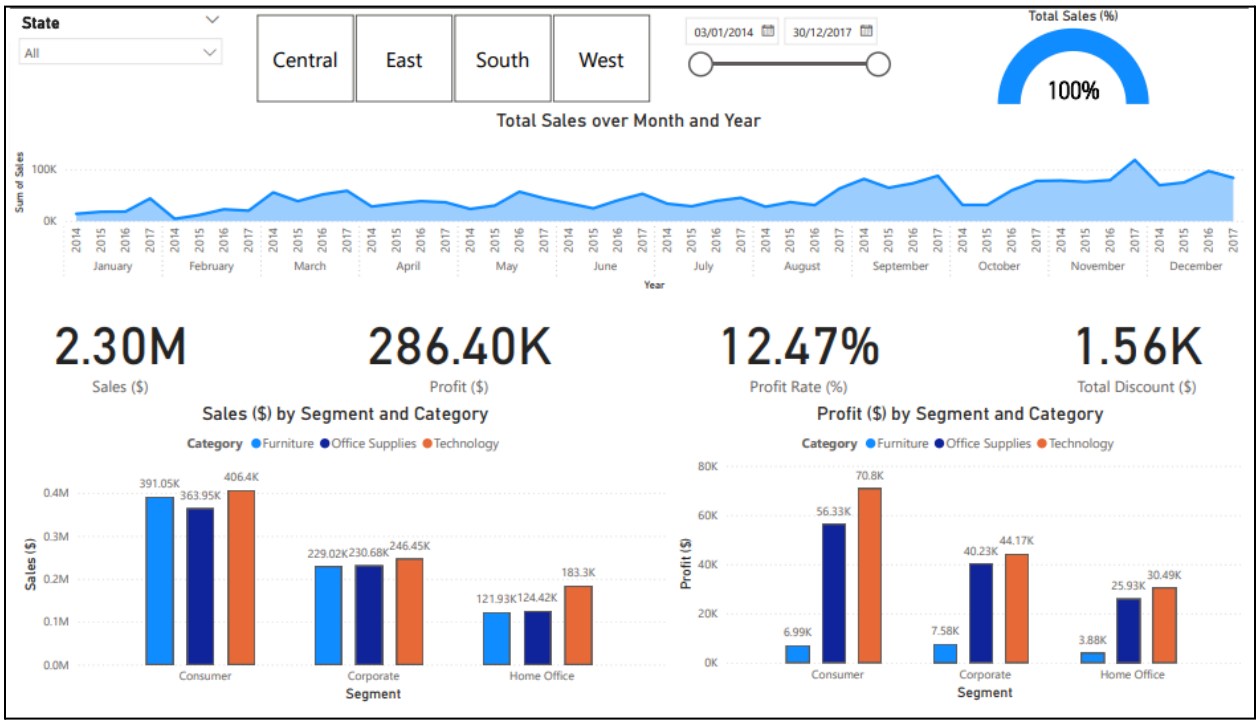


Figure 21: Historical performance dashboard.

Generally speaking, office supply sales exceed those of furniture and technology. The sharp increase in furniture sales towards the end of 2017 points to either successful marketing initiatives or a shift in demand. The biggest swings in technology sales indicate that greater study into the factors behind these swings is needed. The Consumer and Corporate departments, the latter being the bigger, are largely responsible for sales. The home office market increases gradually over time even though it has the lowest sales. The East and West regions lead, but sales are up overall in all of them. The Central area exhibits the most swings, as does the Technology category, which warrants further research.

California and New York routinely produce the largest sales. States with large sales contributions include Texas, Pennsylvania, and Washington. These understandings could boost sales in the future.

To maximise marketing and inventory plans, concentrate on keeping steady sales of office supplies, take advantage of the rising demand for furniture, and look into the reasons behind the variations in technology sales. Especially for the expanding Home Office category, customise marketing and product offers to meet the unique requirements of each. Create focused marketing strategies that speak to the particular requirements and tastes of the clients in each location. Find out why the Central region fluctuates so that growth is steady. Look at expansion prospects in additional states with substantial revenue contributions while giving marketing and sales efforts in high-performing states like California and New York top priority. Through knowledge of these past trends and patterns, Alpha Stores may make data-driven

choices to raise sales in the future. Changing product offers, customising marketing plans for certain markets and areas, and streamlining inventory control can all be part of this.

3b)

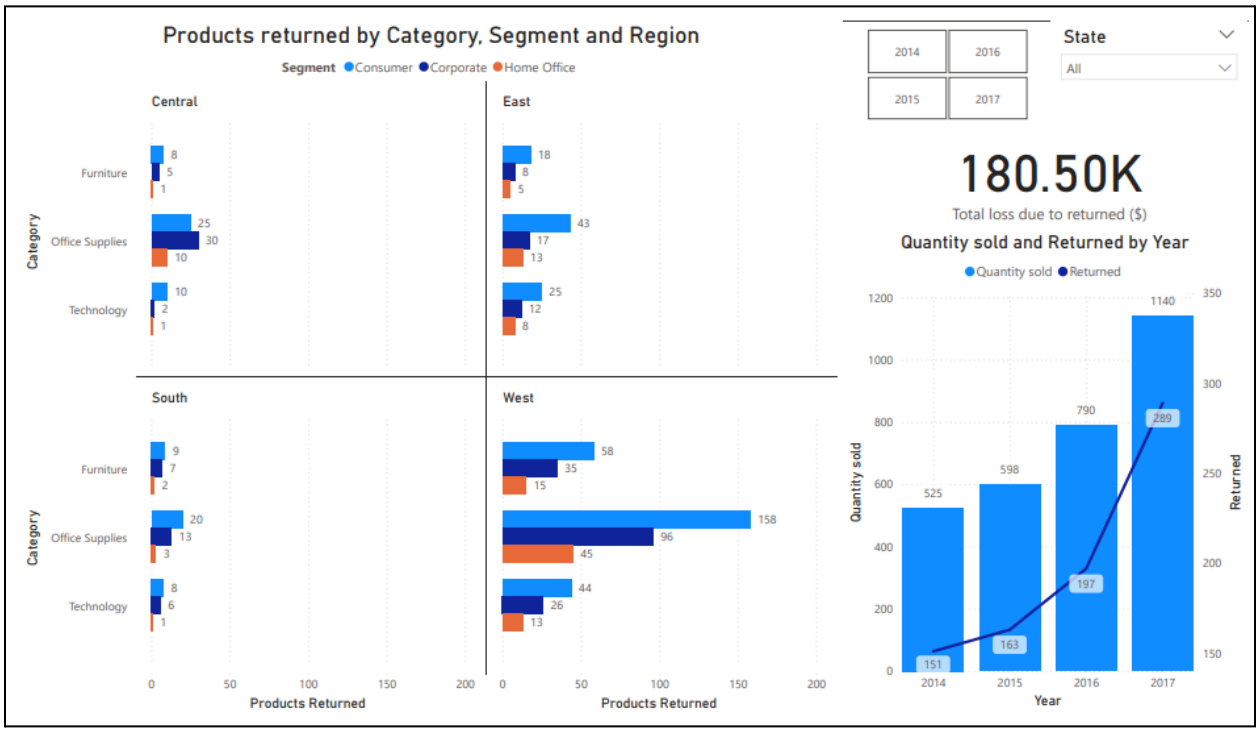


Figure 22: Returns data key trends dashboard.

The highest return rate is found for Technology products: Technology products routinely show a larger percentage of returns than furniture and office supplies across all geographies and segments. This raises the possibility of problems with the functionality, quality, or expectations of the consumer for technological products.

Returns are greatest in the west region: With a far larger number of returned items in every category than any other region, the West is unique. This could point to regionally unique variables that raise returns, such demography, distribution problems, or customer preferences. Return rate of the corporate segment is comparatively lower: Generally speaking, the returns of the business segment are lower than those of the consumer and home office categories. This can be the result of corporate client return policies being tighter, distinct consumer needs, or bulk buying agreements.

In 2014–2017, return rates rose: Product returns have increased generally throughout the course of the four years, with a significant peak in 2017. This could be caused by a number of things, including modifications to marketing plans, product offers, or consumer behaviour. Notwithstanding a rise in the total number of returns, the ratio of quantities sold to quantities returned has not changed between 2014 and 2017. This implies that the rise in returns is not always a sign of a deterioration in the quality of the product or in the contentment of the client, but rather proportionate to the rise in sales.

Recommendations to reduce product returns:

1. **Look into aspects particular to the area:** To determine the fundamental reasons of greater return rates in the West region, carry out market research and analysis. Then, create focused solutions, including as the product selection, marketing message, or distribution methods. Examine consumer reviews and comments. Gather and evaluate user evaluations and comments actively to find recurring problems or grievances and to improve the features, design, or customer service of your products.
2. **Provide good customer service together with flexible return policies:** Even when returns are inevitable, foster trust and loyalty by offering hassle-free return policies and first-rate customer service. Put into action focused marketing initiatives. Start product tutorials or educational efforts to make sure consumers know how to use and maintain technology items correctly, which will lower the likelihood of returns brought on by user mistake or discontent.
3. **Observe patterns of returns and modify tactics**: Track and examine return data often to spot new trends or shifts in consumer behaviour and modify marketing, customer service, and product development plans as needed. The business can proactively handle the found problems, lower product returns, raise customer satisfaction, and eventually increase profitability by putting these suggestions into practice.

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