Project Dissertation Report on

Internal Factors Affecting Sales of a Multichain Retail Store

Submitted By

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(2K19/DMBA/10)

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CERTIFICATE

This is to certify that the work titled **Internal Factors Affecting Sales of a Multichain Retail Store** submitted by Akshita Aggarwal in this project report as part of 4th Semester in MBA (DSM, DTU) during January-May, 2021 was conducted under my guidance and supervision. This work is her original work to the best of my knowledge and has not been submitted anywhere else for the award of any credits / degree whatsoever. The work is satisfactory for the award of MGT-44 Term Project credits.

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DECLARATION

It is hereby certified that the work which is being presented in the MBA Major Project Report entitled **" Internal Factors Affecting Sales of a Multichain Retail Store "** in partial fulfilment of the requirements for the award of the degree of **Masters of Business Administration** of **Delhi School of Management, New Delhi (Affiliated to Delhi Technological University, Delhi)** is an authentic record of our own work carried out during a period from **January 2021 to May 2021** under the guidance of **Mr. Yashdeep Singh, Assistant professor.** The matter presented in the MBA Major Project Report has not been submitted by me for the award of any other degree of this or any other Institute.

Any academic misconduct and dishonesty found now or in future in regard to above or any other matter pertaining to this report shall be solely and entirely my responsibility. In such a situation, I understand that a strict disciplinary action can be undertaken against me by the concerned authorities of the University now or in future and I shall abide by it.

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ACKNOWLEDGEMENT

The completion of this project work could have been possible with continued & dedicated efforts & guidance **Mr Yashdeep Singh**. I acknowledge my deep gratitude to him. The acknowledgement however will be incomplete without specific mention as follows. I wish to acknowledge our deep gratitude to **Dr Archana Singh**, HOD, Department of MBA, Delhi School of Management, DTU for her cooperation and guidance.

Finally, I would like to say that I am indebted to our parents for everything that they have provided and done for me. All of this would have been impossible without their constant support.

EXECUTIVE SUMMARY

The major competition for such stores came from retail giants such as Reliance Fresh, Big Bazaar and Spencer. Also, the recent entry of Walmart into the Indian retail market posed serious challenges as the competitive landscape was heating up.

The advent of online grocery shopping and its rising popularity owing to the convenience and array of shopping options also added to the challenges which stood ahead. Grofers, which was a low-price online supermarket present across 25 cities and Big Basket, which was known for its fresh fruits, vegetables, pulses, spices and beverages were enjoying an exponential increase in their customers.

Whether start-ups or established retail stores, all brands were aggressively expanding their outlets within the country across Tier- I, Tier- II and Tier- III cities offering customized products and prices depending upon the location of the retail store. In times of such a highly competitive environment in the grocery retail industry, most retail chains looked to offer a point of differentiation which would help them garner more customers over the competitors.

Therefore, there is need to analyze the factors that attracted the customers to the retail stores so they could position themselves accordingly for their existing and prospective customers. This research can help stores in increasing their sales by modifying the in-store experience of the outlets along with an understanding of the optimum size and location of the stores.

Reliable retail sales prediction of all types of stores can not only help in making correct inventory purchase decisions but also in determining which new products to be launched.

Therefore, the main aim of this paper is to propose an enhanced method based on stepwise regression and descriptive modelling of the predetermined data to forecast the retail sales of a multi-chain grocery store in different locations. The factors include item visibility, size of store, type of products, MRP of products, establishment year, weight of products, fat content of products, type of store.

The research findings in this paper indicate that display location and other variables affect the sales of a multi chain grocery store. The data, together with necessary information collected in the same study, help in determining insights into supermarket shopping behavior and suggests ways on how merchandising efficiency might be improved.

One of the most difficult decisions a retailer makes is to determine the location of the store. As nowadays convenience is so important to the consumers, a retail store can grow or decline solely depends upon its choice of location. Therefore, the research will also be performed indicating which type of store should be opened in which location.

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CHAPTER 1 : INTRODUCTION

1.1 Background

In the globalization era, the market is enormous and a business has more competitors to compete with. In order to attract consumers and compete with competitors in the market place, the grocery business adopts several marketing tools and strategies. The increasing competition in the global market has motivated organizations to be determined and ensure planning effectively and efficiently than other competitors.

Philip Kotler believed that, “Retailing includes all the activities involved in selling goods or services to the final consumers for personal, non-business use. Any organization selling to final consumers whether it is a manufacturer, wholesaler or retailer – is doing retailing. It does not matter how the goods or services are sold (by person, mail, telephone, vending machine or internet) or where they are sold (in a store, on the street or in the consumer’s home).”

For many years, the academic fraternity and retail professionals have been engaged in research activities in various fields of retailing. The major area of research is on the involvement of shoppers in purchasing. India's food and grocery retail are the most attractive segment in the world and accounts for 60% of total revenue in retail sector, followed by the apparel segment (Deloitte, 2013). For many years, the academic fraternity and retail professionals have been engaged in research activities in various fields of retailing. The major area of research is on the involvement of shoppers in purchasing.

India's food and grocery retail are the most attractive segment in the world and accounts for 60% of total revenue in retail sector, followed by the apparel segment (Deloitte, 2013). For many years, the academic fraternity and retail professionals have been engaged in research activities in various fields of retailing.

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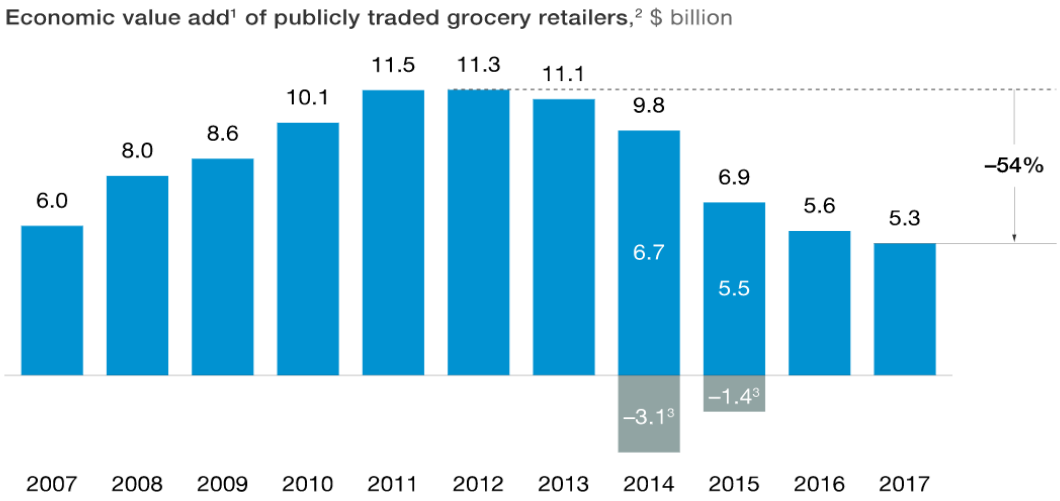
"According to a McKinsey report, the share of an Indian household's spending on food is one of the highest in the world, with 48% of income being spent on food and beverages" (Mittal and Parashar, 2010). The unorganized (Kirana) retailer and grocers holds up to 60% of market share, which forces many big industrialists like Future Group, Reliance, and Spencer's to start investing in retail sector also. Although organized food and grocery is the second largest category, it holds only 11% of the market share in organized retail market after apparel segment (Deloitte, 2013). This can be one of the main backdrops for the modern retail in India.

The major reason for the dismal performance can be ascribed to the fact of blindly following and replicating the westernized format in India without considering the abysmal differences in all types of macro and micro environmental factors (Mittal and Parashar, 2010).

Figure 1: Source: McKinsey Corporate performance Analysis Tool



1.2 Problem Statement

In this paper is I will propose an enhanced method based on stepwise regression and descriptive modelling of the predetermined data to forecast the retail sales of a multi-chain grocery store in different locations. The factors include item visibility, size of store, type of products, MRP of products, establishment year, weight of products, fat content of products, type of store.

1.3 Objectives of Study

(1) To identify the factors responsible for outlet sales.
(2) To identify the location should encourage which type of store.
(3) To analyze if shelf spacing helps in increasing sales?
(4) To determine what type of inventory to be ordered.
(5) To find which type and size of store generate more sales.

1.4 Scope of Study

Customers nowadays desire to anything, anywhere and at any time, that also in minimum prices. Today people have high expectations. In a UK based survey, people said they prefer healthier food choices when compared with regular ones. They also wanted to be aware of how exactly food comes from and how is it prepared; they also expect companies to be responsible towards environment and society. At the same time, they demand deals and discounts and choose option that provides minimum price and best quality. Finally, they are nowadays more attracted towards the seamlessness and convenience of online shopping. The retailers and organized grocers (Kirana) therefore finding difficult to meet customers' expectations of low price and high quality of product. Other type of retailers have entered in the market as the unorganized sector couldn't adapt changes, some of them includes discounters, convenience store chains and online retailers. Consumer packaged-goods (CPG) manufacturers also stepped in and began selling products directly to the customers.

Discounters are the most highlighted ones. Schwarz Group, which owns discounters Lidl, is now one of the Europe's biggest food retailers. ALDI and Lidl are trying to establish their foot in the US market as well. With the controlled assortment and it focuses on providing great value for each product. However, due to their low prices overall revenue of industry is decreased by four percent. Moreover, the growing competition between shopping malls and traditional kirana stores poses a challenge to organized retailers to consider an alternative method to generate excitement among the customers and to increase the shopper's patronage (Rajagopal, 2009). It has become essential to find some solutions for the organized retail in India. Further, we need to recognize the factors considered by consumers to visit organized food and grocery retail.

For the organisation studied in this research paper, in-store retailing is decreasing year by year and due to non-uniform pattern of sales, organization facing problems in inventory ordering and various type of stores management in various locations. The location of a retail store also plays a vital role in its success as it helps in determining retail strategy. The store image is directly dependent on the location of the store and therefore while establishing the store owner stop always analyze the outcomes.

Many online players have also stepped in grocery business, one is Amazon, who is in lime light because of its acquisitions with Whole Foods Market (WFM). Together they are trying to provide low prices for the product. In China additionally retailers like Alibaba plans to coordinate on the web and disconnected channels, it calls its biological system "New Retail".

McKinsey analysis suggests that, “By 2026, between $200 billion and $700 billion in revenues from traditional grocery retailers could have a shift to other formats and channels which can further hurt sales productivity of retail industry.”

These factors generate are required to analyse store attributes of multi-chain grocery stores of an organization to not only predict sales but also for maximization of profits, provides store offers minimum prices for the products.

CHAPTER 2: LITERATURE REVIEW

Different attributes are studied through various research paper, few summaries is mentioned below that conducted research on factors influencing sales and assortment of products. Some of the studies are listed below are:

- (Martineau, (1958)), isolated store properties into two primary classes, i.e., functional and psychological. The functional classification establishes properties area, arrangement of items and store design. The psychological class establishes the emotions created by the utilitarian components of the store. The functional category is more prominent in research paper when compared with psychological.

- In the investigation of retail chains led by (Berry, John H. Kunkel and Leonard L.), chipped away at twelve variables - cost of product, quality, variety, style of stocks, deals work force, deals advancement, publicizing, store environment, locational availability, administration, notoriety on changes and different elements. In a subsequent study, Berry (1969) identified three general factors that predominantly influenced consumer's store choice regardless 40 KAIM Journal of Management and Research Vol. 3 No. 2 November - April 2011 of store type: namely, quality and variety of merchandise, sales staff, and store atmosphere.

- A prominent and widely-cited work on the topic of store image was that of (Lindquist)). Based on a review of 19 research articles, he synthesized the framework of these studies into a set of nine groups: merchandise, service, clientele, physical facilities, promotion, accessibility, store atmosphere, institutional and post-transaction satisfaction.
- (Doyle & Fenwick, (1975)), propose that price, product variety, one-stop shopping, quality, location of the store, advertisement, general appearance of the store and convenience are some of major attributes looked upon by the consumers while evaluating a grocery store.
- (Bearden, (1977)) distinguished seven attributes as potentially significant for store patronage: price, quality of merchandise, assortment, atmosphere, location, parking facilities and friendly staff.

- (Arnold et al. (1983)) extended the accessibility attribute to the ease of mobility through the store and fast checkout.

- (Mason, Mayer, and Ezell, (1994)), in their paper anticipated that costs plays a fundamental role in deciding consumer loyalty just as building client devotion in a retail location. In the retailing sector, the store having reasonable prices will often capture a large market share.

- (Hasty and Reardon, (1997)) classified store attributes into three general categories: accessibility (e.g., location, layout, appearance, and knowledgeable staff), facilitation of sales (e.g., low-priced specials, promotional offers and methods of payments accepted) and auxiliary attributes (e.g., play areas for children and food court).
- (Wong and Sohal, (2003)), attempted to decide the connection between administration quality and client eminence in retail chain of departmental stores in various locations. The results showed that service quality is positively associated with customer loyalty, and that the most significant predictor of customer loyalty in the city retail district is empathy, while the most significant predictor of customer loyalty in the country retail district is tangibles.

- (Solgaard and Hansen, (2003)) worked on factors important for customer evaluation of stores. These attributes include merchandise, assortment, merchandise quality, personnel, store layout, accessibility, cleanliness and atmosphere.

- (Spiller Bolten and Kennerknecht, (2006)) analyzed two variables, i.e., service and product quality used to predict customer satisfaction. They recommend that clients think about newness of foods grown from the ground as the nature of entire arrangement.

- In 2010 Ghosh, Tripathi and Kumar in their investigation attempted to deliver issues identified with store properties and its pertinence in the store determination by consumers. Eleven variables (store attributes) were used in the research paper.

- (Huddleston, Whipple, Mattick, and Lee, (2009)), performed study US family units, compared the client observations related with fulfillment of ordinary supermarkets with specialty stores. Item collection, quality, cost and administration were utilized to anticipate store fulfillment for each sort of store position. The outcomes indicated that

the impression of the fulfillment was higher among the specialty supermarket clients when compared with the regular market clients. For both store designs, the investigation found that the store value, item variety, administration and quality decidedly impacted fulfillment. Stepwise regression was performed and indicated that each store attribute contributed differently to store satisfaction for conventional and specialty store formats.

- (Hansen and Deutscher (1978)), presented study on “An empirical investigation of attribute importance in retail store selection”. They inspected the significance of different parts of retail image on various purchaser fragments. They made examination of various traits across departmental and supermarkets to demonstrate harmoniousness and inferred that a same retail characteristics value, shading, quality and product were significant across various kinds of stores.

- In 2004 Nor Khalidah Abu introduced paper on "Administration Quality Dimensions: A Study on Various Sizes of Grocery Retailers". He recognized that the administration quality measurements basic to urban basic food item customers for little, medium and huge estimated supermarkets. It was an endeavor to recognize the basic quality element of Malaysian urban basic food item customers dependent on the Retail Service Quality Scale that considers the staple retail setting .The investigation was done as the littler markets in Malaysia were offering increasingly close to home administrations yet with insufficient stocks and offices; a complexity to the bigger retailers which are viewed as offering better product decision and open enhancements however with normalized and non-customized administrations.

- (Muhamad Jantan and Abdul Razak Kamaruddin (1999)) in the study on “Store image and store choice decision in Malasiya”, performed the study of for major retail stores-Super, Gama, Suiwah and Yoahan in the Island of Penang. It was further analyzed based on Size, Variety of the store and the notoriety of these stores in the northern Malaysia. At last it was discovered that location and price were the noticeable elements for store decision of the client.

CHAPTER 3: RESEARCH METHODOLOGY

4.1 Variables and Measurements

In determining the variables affecting the multi-chain retail store multiple regression analysis and visualization analysis must be done to determine the nature of relationship between the variables.

The regression model specifications:

$$y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 \ldots b_n x_n + e_i \text{ for } i = 1,2, \ldots n.$$

In this equation, y is the value of predicted variable or dependent variable of the n different independent variable. x is the value independent variables.

The b's - $b_0, b_1, b_2, \ldots, b_i$. The b's are constants and known as regression coefficients. Values are assigned to the b's based on the principle of least squares.

For visualization description tableau which converts raw and unstructured data into understandable format. Analysis is done on primary data of multi-chain retail store.

This is cross-sectional data and is assumed to be of 2019.

And regression equation with an interaction:

$$y = b_0 + b_1x_1 + b_2x_2 + b_3x_1x_2$$

In the above equation b_3 is a regression coefficient, and x_1x_2 is the interaction, The interaction between x_1 and x_2 is called a two-way interaction. High-order interactions are also possible between independent variables, three-way interaction is shown in the following equation:

$$y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_1x_2 + b_5x_1x_3 \ldots\ldots b_nx_1X_2x_{3\ldots} x_n.$$

Item Sales is our dependent variables and all other are independent variables, used to predict item sales

Table 3.1: Variables and their values

Variables	Label used in research	Description	Values/ Measurement
Location Type	Outlet_Location_Type	It is categorical variable and defines the location of the stores.	Tier 1, Tier 2, Tier 3 Categorical
Store Size	Outlet_Size	It is categorical variable and defines the size of the stores.	Large, Medium, Small Categorical
Item visibility	Item_Visibility	It is a numeric value and calculated by calculating the distance from the reference point, i.e., distance of item in the shelf.	x: [0,1] (Float) Float Numeric
Item weight	Item_Weight	It is numeric value and is the absolute value of the item.	Integer Numeric
Item type	Item_Type	It is a categorical value. Total number of items are 16.	Categorical -16
MRP	Item_MRP	It is integer value and absolute in nature. It is maximum retail price of the item.	Integer Numeric
Establishment year	Outlet_ Establishment _Year	It is the year of establishment of all stores.	Date [Year]
Fat content	Item_Fat _Content	It is a categorical value. Every item's fat content is measured in only two categories, i.e., low and regular.	Low fat, Regular fat Categorical

Type of store	Outlet_Type	It is a categorical value and identified as convenience, specialty, departmental and grocery.	Convenience, specialty, Departmental, Grocery Categorical
Outlet identifier	Outlet _Identifier	It is unique identifier of every outlet.	Categorical
Item Identifier	Item_Identifier	It is unique identifier of every item used for its identification by the store.	Unique code
Item sales	Item_Outlet _Sales	It is the absolute value. The sales of a particular item.	Integer Numeric
Derived variables*	Quantity_sold, year 1	Quantity_sold = Item Sales/MRP Year 1 = 2020-Establishment year	Integer Numeric

*Desired variables are quantity sold which is derived from Sales/MRP. Assuming item is sold at MRP. Year1 is derived from establishment of the store, assuming data is of 2020 and therefore, subtracting establishment year from 2020.

4.2 Hypothesis

According to report on "Grocery Retailing in Asia Pacific" by KPMG (2009), the outlook of retail industry in Asia had never been more promising, retailers are struggling not only to gain but to preserve market share in the competitive world. The report reasoned that there are huge open doors for the retailers, and whether this development is accomplished naturally, or by obtaining, joint endeavor or vital union, careful business and market examination will be basic to help guarantee that the methodology fits the business targets and client needs.

Therefore, the study considered to check the impact of various variables on sales. Accordingly, the four hypotheses have been formulated, giving attention to the relationship with the literature support.

H_{1a}: Item fat content impact item sales.

H_{1b}: Establishment year of store impact sales.

H_{1c}: Item visibility positively impact item sales.

H_{1d}: Weight of items impact sales.

4.3 Characteristics of Sample Population

Total sample in the main survey includes 8524 item identifiers, in the three type of cities in India. Outlet can be classified as Supermarket, Grocery store, departmental store, specialty store, convenience store. The supermarket1, supermarket2, supermarket3 is basically departmental store, specialty store and convenience store respectively. The Item Visibility ranges from 0 to 1 for different Item Identifiers. There are different types of food products available in the stores. These can be Dairy, Soft drinks, Baking goods, breads, frozen foods. Each outlet store is classified into small, medium, high depending on size of the store. There is total ten stores, three in tier 1, three in tier 2 and four in tier 3.

By March 2015, Company had managed to establish 4 retail outlets. The product offerings by Company had expanded from simply grocery items to include packaged food as well. The major customers of Company included newly married couples and unmarried young professionals who were part of the corporate workforce and lacked the time and energy to engage in grocery shopping. The retail outlets were also located strategically in localities where high proportions of their target market lived. The grocery items were priced very competitively which attracted many customers across all the retail outlets and very soon Company had acquired maximum market share among the competing grocery retail chains.

Towards the end of 2018, Company acquired an upcoming grocery chain which had multiple stores across Tamil Nadu, Karnataka, Kerala and Andhra Pradesh. This move helped Company expand into the Southern part of India and by 2018 Company had created its presence PAN India with its retail stores in 24 states within the country. The mission of the brand was to deliver a one-stop solution to all grocery and immediate daily needs of its customers. Moreover, they aimed to make the shopping experience more enjoyable and practical for the store visitors.

4.4 Data

Data Source : Kaggle

Due to Covid situation, data couldn't be collected from industry specialist. Therefore, dataset from Kaggle has been used. Below is the glimpse of the data:

Total Records: 8524

Item_Iden	Item_Wei	Item_Fat_	Item_Visit	Item_Type	Item_MRP	Outlet_Ide	Outlet_Est	Outlet_Siz	Outlet_Lo	Outlet_Ty	Item_Outl	Quantity_sold
FDA15	9.3	Low Fat	0.016047	Dairy	249.8092	OUT049	1999	Medium	Tier 1	Departme	3735.138	14
DRC01	5.92	Regular	0.019278	Soft Drinks	48.2692	OUT018	2009	Medium	Tier 3	Speciality	443.4228	9
FDN15	17.5	Low Fat	0.01676	Meat	141.618	OUT049	1999	Medium	Tier 1	Departme	2097.27	14
FDX07	19.2	Regular	0	Fruits and	182.095	OUT010	1998	Medium	Tier 3	Grocery St	732.38	4
NCD19	8.93	Low Fat	0	Household	53.8614	OUT013	1987	Large	Tier 3	Departme	994.7052	18
FDP36	10.395	Regular	0	Baking Go	51.4008	OUT018	2009	Medium	Tier 3	Speciality	556.6088	10
FDO10	13.65	Regular	0.012741	Snack Foo	57.6588	OUT013	1987	Large	Tier 3	Departme	343.5528	5
FDP10	12.86	Low Fat	0.12747	Snack Foo	107.7622	OUT027	1985	Medium	Tier 3	Convenien	4022.764	37
FDH17	16.2	Regular	0.016687	Frozen Foo	96.9726	OUT045	2002	Small	Tier 2	Departme	1076.599	11
FDU28	19.2	Regular	0.09445	Frozen Foo	187.8214	OUT017	2007	Large	Tier 2	Departme	4710.535	25
FDY07	11.8	Low Fat	0	Fruits and	45.5402	OUT049	1999	Medium	Tier 1	Departme	1516.027	33
FDA03	18.5	Regular	0.045464	Dairy	144.1102	OUT046	1997	Small	Tier 1	Departme	2187.153	15
FDX32	15.1	Regular	0.100014	Fruits and	145.4786	OUT049	1999	Medium	Tier 1	Departme	1589.265	10
FDS46	17.6	Regular	0.047257	Snack Foo	119.6782	OUT046	1997	Small	Tier 1	Departme	2145.208	17
FDF32	16.35	Low Fat	0.068024	Fruits and	196.4426	OUT013	1987	Large	Tier 3	Departme	1977.426	10
FDP49	9	Regular	0.069089	Breakfast	56.3614	OUT046	1997	Small	Tier 1	Departme	1547.319	27
NCB42	11.8	Low Fat	0.008596	Health and	115.3492	OUT018	2009	Medium	Tier 3	Speciality	1621.889	14
FDP49	9	Regular	0.069196	Breakfast	54.3614	OUT049	1999	Medium	Tier 1	Departme	718.3982	13
DRI11	12.86	Low Fat	0.034238	Hard Drink	113.2834	OUT027	1985	Medium	Tier 3	Convenien	2303.668	20
FDU02	13.35	Low Fat	0.102492	Dairy	230.5352	OUT035	2004	Small	Tier 2	Departme	2748.422	11
FDN22	18.85	Regular	0.13819	Snack Foo	250.8724	OUT013	1987	Large	Tier 3	Departme	3775.086	15
FDW12	12.86	Regular	0.0354	Baking Go	144.5444	OUT027	1985	Medium	Tier 3	Convenien	4064.043	28
NCB30	14.6	Low Fat	0.025698	Household	196.5084	OUT035	2004	Small	Tier 2	Departme	1587.267	8
FDC37	12.86	Low Fat	0.057557	Baking Go	107.6938	OUT019	1985	Small	Tier 1	Grocery St	214.3876	1
FDR28	13.85	Regular	0.025896	Frozen Foo	165.021	OUT046	1997	Small	Tier 1	Departme	4078.025	24
NCD06	13	Low Fat	0.099887	Household	45.906	OUT017	2007	Medium	Tier 2	Departme	838.908	18
FDV10	7.645	Regular	0.066693	Snack Foo	42.3112	OUT035	2004	Small	Tier 2	Departme	1065.28	25
DRJ59	11.65	Low Fat	0.019356	Hard Drink	39.1164	OUT013	1987	Large	Tier 3	Departme	308.9312	7
FDE51	5.925	Regular	0.161467	Dairy	45.5086	OUT010	1998	Medium	Tier 3	Grocery St	178.4344	3
FDC14	12.86	Regular	0.072222	Canned	43.6454	OUT019	1985	Small	Tier 1	Grocery St	125.8362	2
FDV38	19.25	Low Fat	0.170349	Dairy	55.7956	OUT010	1998	Medium	Tier 3	Grocery St	163.7868	2
NCS17	18.6	Low Fat	0.080829	Health and	96.4436	OUT018	2009	Medium	Tier 3	Speciality	2741.764	28
FDP33	18.7	Low Fat	0	Snack Foo	256.6672	OUT018	2009	Medium	Tier 3	Speciality	3068.006	11
FDO23	17.85	Low Fat	0	Breads	93.1436	OUT045	2002	Medium	Tier 2	Departme	2174.503	23
DRH01	17.5	Low Fat	0.097904	Soft Drinks	174.8738	OUT046	1997	Small	Tier 1	Departme	2085.286	11
NCX29	10	Low Fat	0.089291	Health and	146.7102	OUT049	1999	Medium	Tier 1	Departme	3791.065	25
FDV20	12.86	Regular	0.059512	Fruits and	128.0678	OUT027	1985	Medium	Tier 3	Convenien	2797.692	21
DRZ11	8.85	Regular	0.113124	Soft Drinks	122.5388	OUT018	2009	Medium	Tier 3	Speciality	1609.904	13
FDX10	12.86	Regular	0.123111	Snack Foo	36.9874	OUT027	1985	Medium	Tier 3	Convenien	388.1614	10
FDB34	12.86	Low Fat	0.026481	Snack Foo	87.6198	OUT027	1985	Medium	Tier 3	Convenien	2180.495	24
FDU02	13.35	Low Fat	0.102512	Dairy	230.6352	OUT046	1997	Small	Tier 1	Departme	3435.528	14
FDK43	9.8	Low Fat	0.026818	Meat	126.002	OUT013	1987	Large	Tier 3	Departme	2150.534	17
FDA46	13.6	Low Fat	0.117818	Snack Foo	192.9136	OUT049	1999	Medium	Tier 1	Departme	2527.377	13

Figure 3.1: Dataset

CHAPTER 4: ANALYSIS

There are various attributes on which the sales were dependent. Outlet can be classified as Supermarket, Grocery store, departmental store, specialty store, convenience store. These things also influence the sales of the company in the long run. In the data collected by market research team that is available for analysis, the supermarket1, supermarket2, supermarket3 is basically departmental store, specialty store and convenience store. The Item Visibility ranges from 0 to 1 for different Item Ids.

Different Item Types need to be placed differently on the shelves. There are different types of food products available in our store. These can be Dairy, Soft drinks, Baking goods, breads, frozen foods. Each outlet store is classified into small, medium, high depending on size of the store. Sales is the most important factor that the upper management will look to predict. As in retail chains the margin is very low for the retailer.

Before starting the analysis, the data needs to be cleaned – following issues were detected with the data:

- Name Inconsistency- The spelling of low fat (Fat content) was different in various rows which could create issue with the analysis as system will consider them as different categorizations.
- There were few outliers in case of data visibility, which was removed as they could affect the analysis.
- Duplication/ Redundancy - There were few redundant values which was removed before analysis.

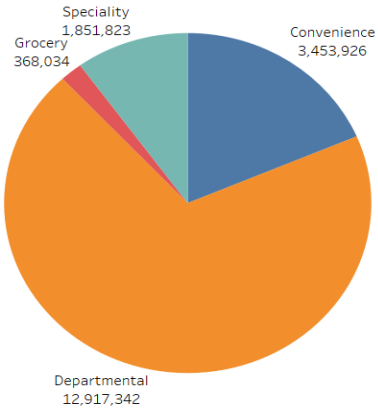
It was made sure that the data was met with all the 5 following quality checks.

1. **Validity.** The degree to which your data conforms to defined business rules or constraints.
2. **Accuracy.** Ensure your data is close to the true values.
3. **Completeness.** The degree to which all required data is known.
4. **Consistency.** Ensure your data is consistent within the same dataset and/or across multiple data sets.
5. **Uniformity.** The degree to which the data is specified using the same unit of measure.

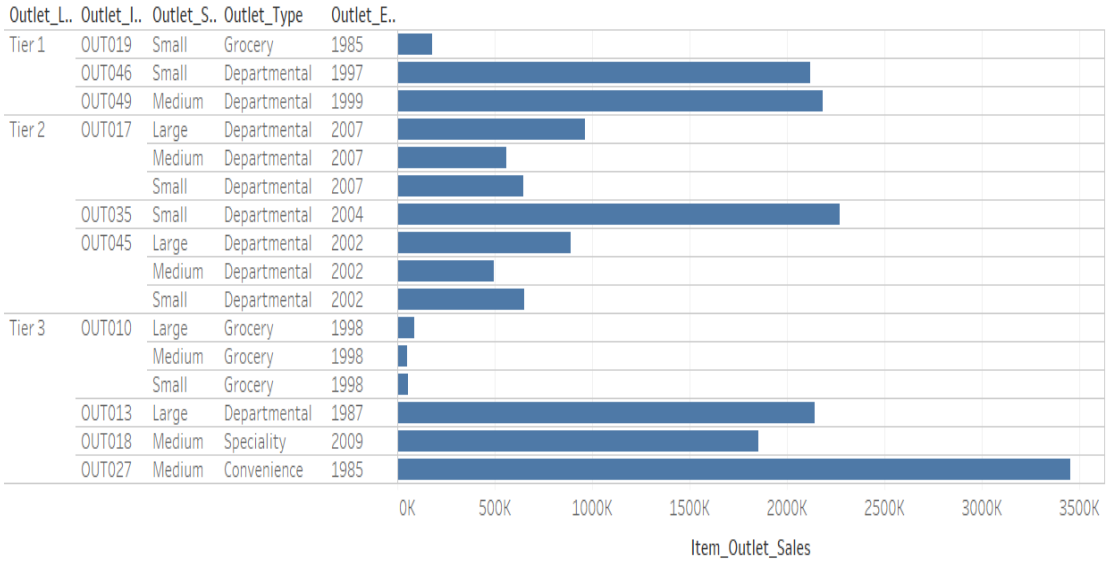
4.1 Descriptive Analysis

Descriptive analysis is done on tableau *Version: 2019.1.*

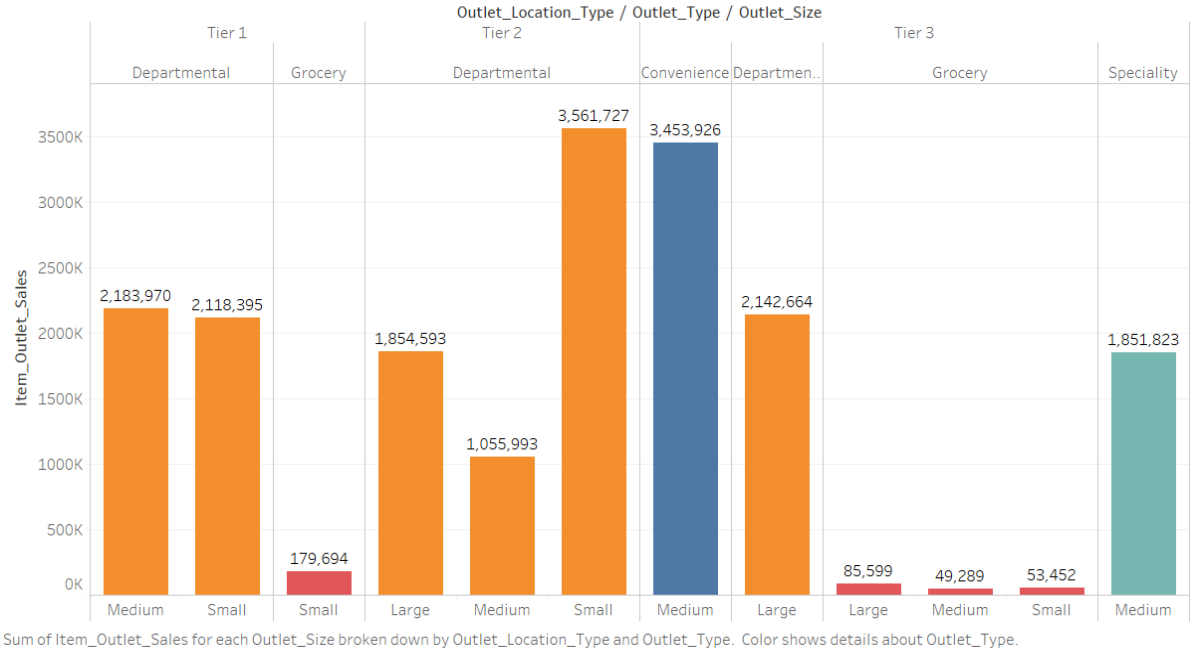
Graph 4.1 Pie chart depicting sales of each type of type store in summation.



Graph 4.2: Item sales v/s Outlet location/Establishment year/ Outlet type/ Outlet size/ Outlet Identifier



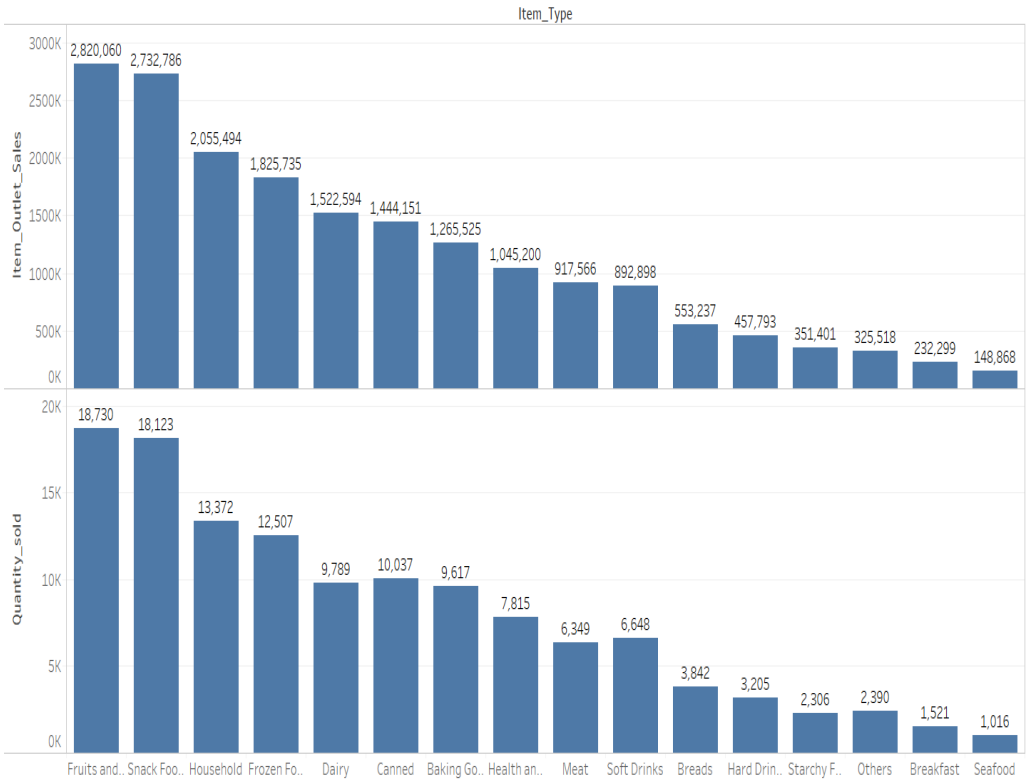
Graph 4.3: Item sales v/s Outlet location/ Outlet type/ Outlet size



INFERENCES

- From the above plot we can analyze that company should open more medium size store than large size, as the expense is more in large sized and revenue generation are less as compared to medium stores.
- The small stores are also generating revenue more than small size outlets. The expense of small sized stores is less and therefore profit margin increases.
- The expansion should be of medium and small sized stores. The large sized expansion will not generate satisfactory revenue.
- From the above plot we can analyze that that is popular among tier 3 cities and least popular in tier 1 cities. There is need to create brand value in tier 1 cities as most of the population is shifting to these cities.
- According to the plot grocery stores of the company are not very popular, they could be merged with other type of stores or could be closed as they are not generating much of a revenue.
- Departmental stores in both tier 1 and tier 2 are doing well and could be expanded more to increase sales.

- In tier 3 departmental and specialty stores need a boast, and need to campaign well. In total tier 3 cities are generating maximum revenue through various stores.
- As analyzed earlier grocery stores are only 2 in total owned by the company are not at all doing well, so my recommendation would to change the grocery store to departmental store. Or else aggressive marketing has to be adopted for grocery stores.
- In tier 2 cities expansion can be done as all the 3 departmental stores are performing are good and expansion can increase brand value, which could increase revenue generation. In tier 3 cities convenience stores could be expanded and other stores need more publicizing activities.
- The accommodation of more items in departmental stores can be done, like merging with grocery store. According to size of the store the more items can be accommodated.
- The OUT045 also doesn't have satisfactory revenue generation in large size. The OUT019 also generates less revenue and needs modifications.
- The OUT010 generating very low revenue in comparison and therefore is advised to close or merge or convert it into other type of store. In small size it could be advertised or could try increase revenue.



Sum of Item_Outlet_Sales and sum of Quantity_sold for each Item_Type.

Graph 4.4: Quantity sold v/s Outlet location/ Outlet type/ Outlet size/ Item type/ Outlet Identifier

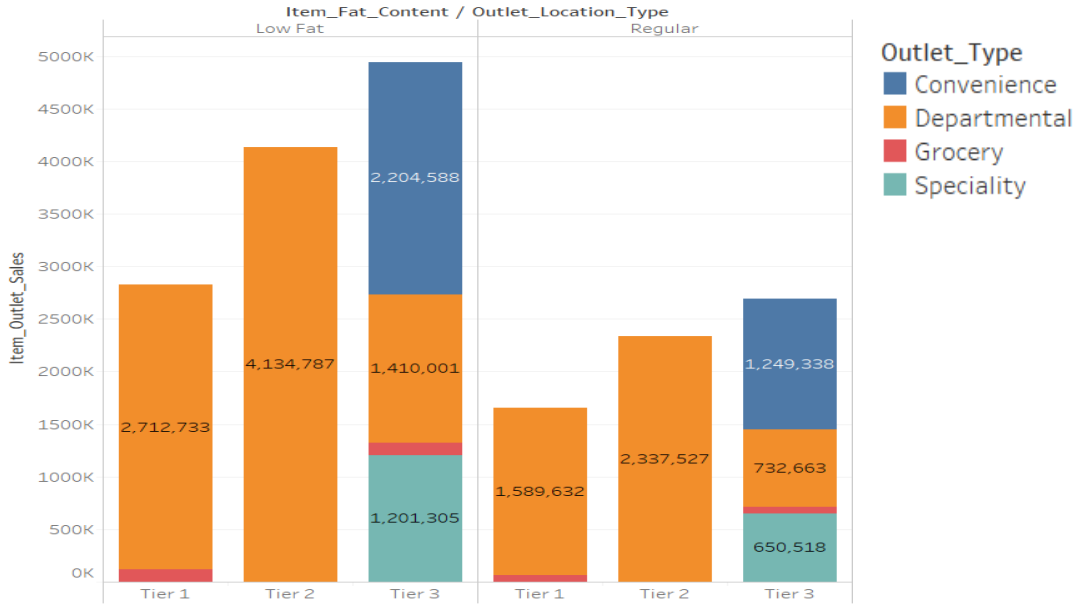
Outlet_Location_Type / Outlet_Size / Outlet_Type / Outlet_Identifier

	Tier 1			Tier 2				Tier 3								
	Medium	Small		Large		Medium		Small			Large		Medium			Small
	Depart..	Depart..	Grocery	Departmental		Departmental		Departmental			Depart..	Grocery	Conven..	Grocery	Special..	Grocery
Item_Type	OUT049	OUT046	OUT019	OUT017	OUT045	OUT017	OUT045	OUT017	OUT035	OUT045	OUT013	OUT010	OUT027	OUT010	OUT018	OUT010
Snack Foods	2,225	1,918	154	1,017	919	598	448	463	2,348	555	2,063	60	3,474	43	1,806	32
Fruits and Vegetabl..	2,259	1,893	135	1,007	823	617	662	491	2,114	666	2,237	59	3,918	41	1,775	33
Household	1,706	1,440	89	531	590	453	364	450	1,748	506	1,589	47	2,504	48	1,268	39
Canned	971	1,215	91	532	576	338	270	345	1,360	300	1,005	22	1,964	27	1,005	16
Dairy	1,156	1,169	87	502	428	312	215	394	1,136	376	1,178	35	1,758	18	1,000	25
Frozen Foods	1,453	1,729	85	750	529	313	228	655	1,414	406	1,405	52	2,257	13	1,179	39
Baking Goods	1,070	1,359	95	454	503	358	279	376	960	343	1,134	39	1,698	14	917	18
Meat	801	655	67	307	292	148	137	241	704	107	645	47	1,527	16	635	20
Health and Hygiene	854	958	66	373	368	310	270	275	849	166	847	43	1,590	21	804	21
Soft Drinks	754	649	49	344	295	191	308	359	773	263	856	24	1,160	15	591	17
Breads	407	453	31	175	256	65	67	79	529	182	392	23	783	6	387	7
Others	305	293	25	110	108	33	92	100	276	122	249	5	388	6	270	8
Breakfast	203	144	26	36	56	33	13	92	195	59	165	10	331	0	148	10
Hard Drinks	480	325	12	154	296	164	50	62	369	70	353	3	567	7	283	10
Seafood	74	146	10	30	64	20	58	9	169	70	70	1	162	4	129	
Starchy Foods	276	249	4	107	94	44	99	148	383	70	267	12	349	2	202	0

Sum of Quantity_sold broken down by Outlet_Location_Type, Outlet_Size, Outlet_Type and Outlet_Identifier vs. Item_Type. Color shows sum of Quantity_sold. The marks are labeled by sum of Quantity_sold.

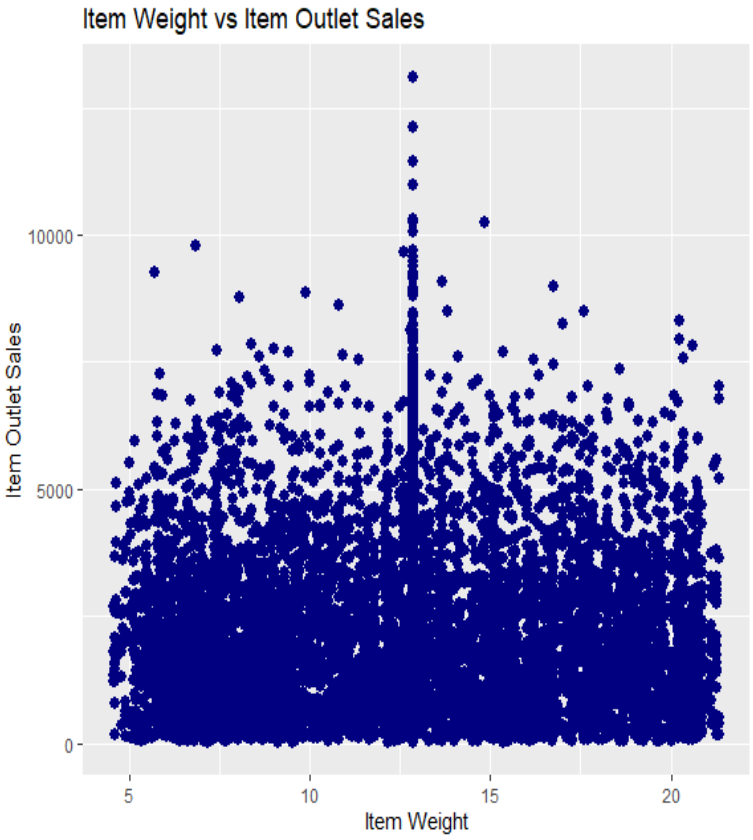
Graph 4.5

a.) Sales v/s Outlet location/ Outlet type/ Fat content



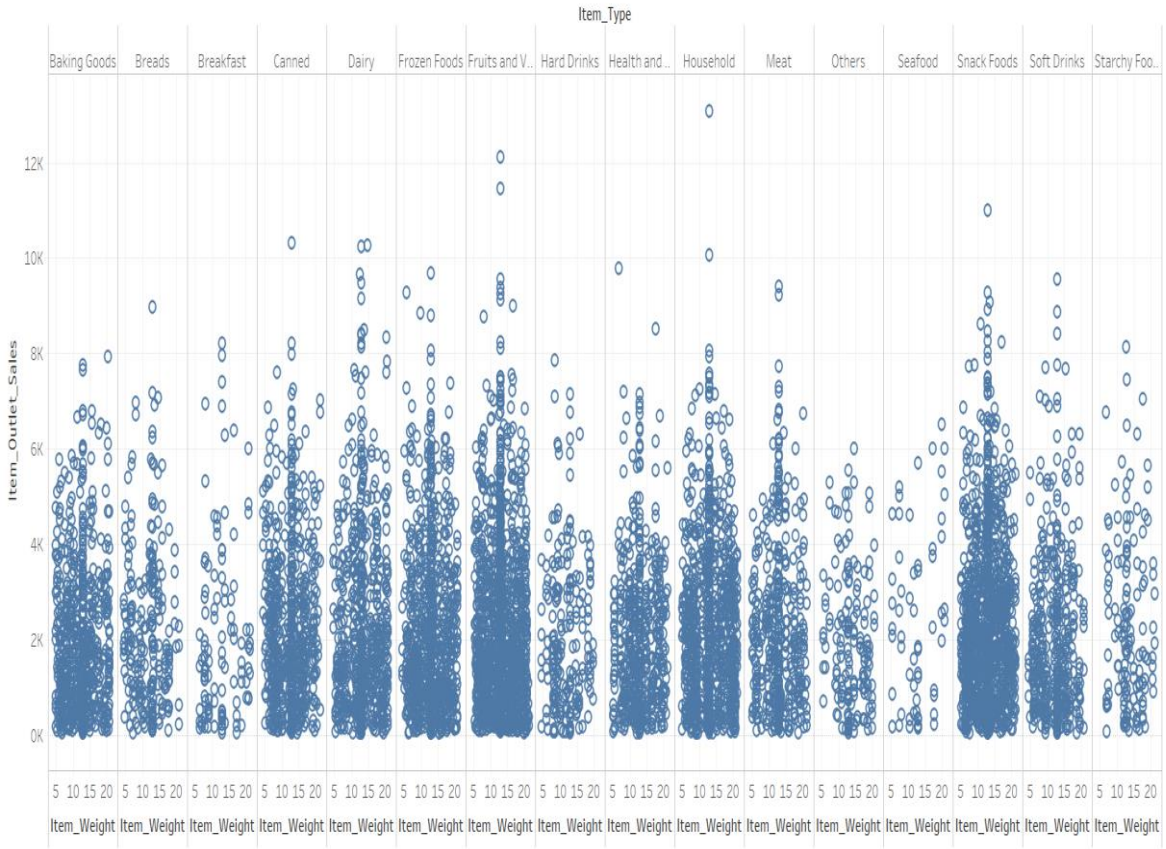
Sum of Item_Outlet_Sales for each Outlet_Location_Type broken down by Item_Fat_Content. Color shows details about Outlet_Type.

b.) Sales v/s Item weight



- From the plot above, we can analyze that as weight of a product increases, sales increases and after a point it again starts decreasing.
- This indicates customer purchases maximum around 12, therefore quantity items of weight 12 should be kept in maximum number and below and above 12 should be kept in proportionate order.

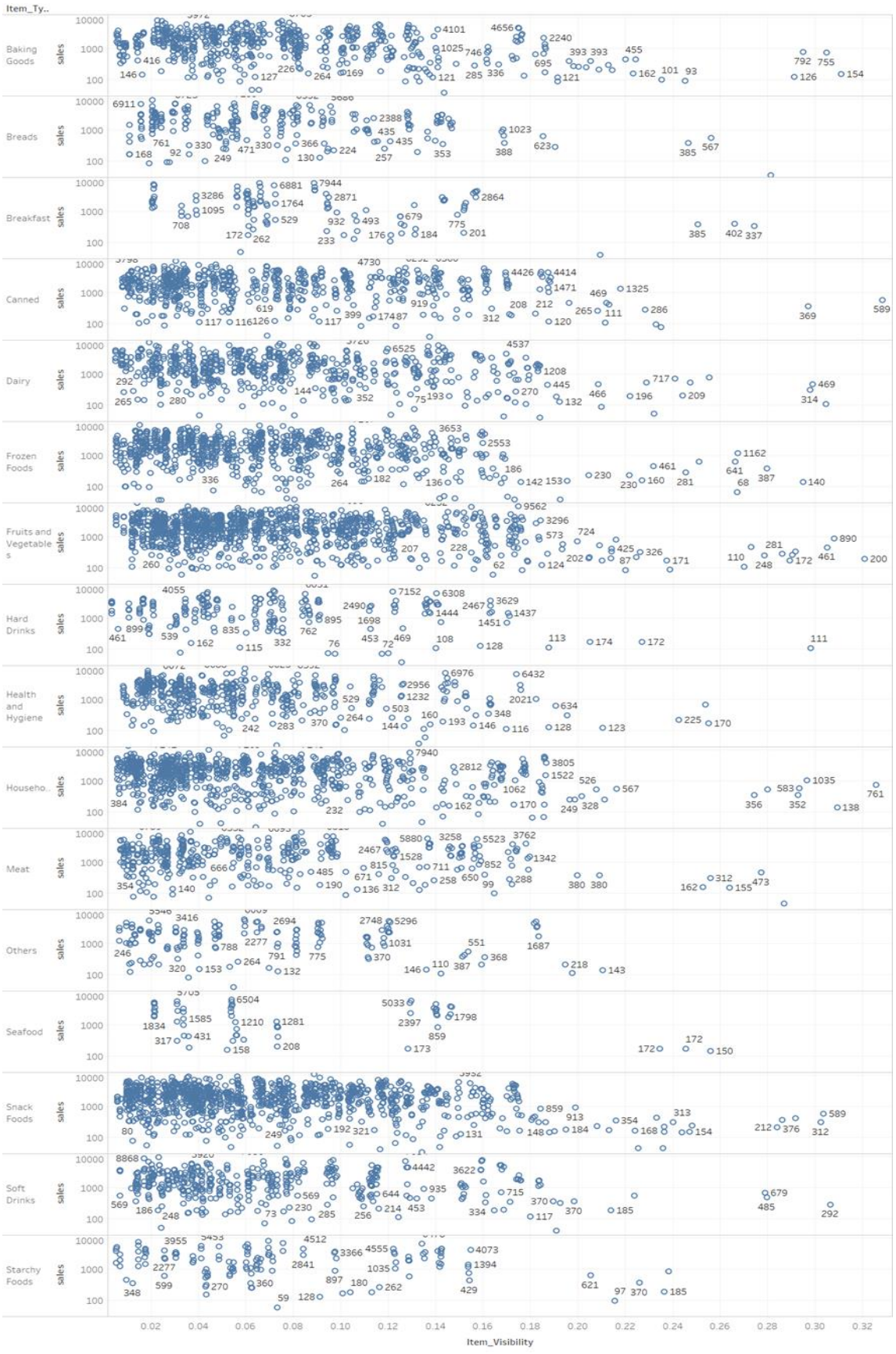
c.) Sales v/s Item weight vs Item type



Item_Weight vs. Item_Outlet_Sales broken down by Item_Type.

- Pattern in individual item is observed like, breads after 12.86 as weight increases the sales decreases.
- The example of this concept can be seen, like tea, where daily consumers usually buy 1kg or 0.5kg pack and above this weight the consumers started decreasing. Below this weight also customers don't buy as this small packs won't last for a month and grocery shopping are done for whole month.
- The same can be implemented above to various products.
- However, in some item the scenario is different, like in seafoods the pattern is not observed.

Graph 4.6 Item sales v/s Item type/Item visibility



- According to data, fruits and vegetable, snack foods are of maximum sale and therefore should kept in maximum quantity and on the other hand breakfast, seafoods are sold in very less quantity and therefore should be kept in small amounts.
- OUT010 in small size should not keep seafood and starchy foods at all. In medium size breads, breakfast, seafood and starchy foods should be ordered in limited stalks or could also be avoided. In large size it should keep limited stock of others, seafoods and hard drinks.
- Tier 1 shops could produce more snack foods, fruits and vegetables, households and could keep starchy foods, seafoods and hard drinks in less amount.
- Seafood should be kept only on limited shops, i.e., OUT049, OUT046 OUT035, OUT045, OUT018, OUT027. Other shops could avoid keeping it or could keep it in very small amount.
- In tier 2 medium stores, breakfast should be kept in small amount as the sale is not much as compared to size Low fat products sell more than regular products. Therefore, low fat products stock should be more than regular products.
- From the plot above, we can analyze that as weight of a product increases, sales increases and after a point it again starts decreasing. This indicates customer purchases maximum around 12.86, therefore quantity items of weight 12.86 should be kept in maximum number and below and above 12.86 should be kept in proportionate order. However, in some item the scenario is different, like in seafoods the pattern is not observed.
- OUT010: Starchy foods are sold more when visibility is more. The sales of seafoods could increase with visibility. Other products are not affected with visibility. It should not be very low and not very high it should range more than 0.02 and less than 0.24
- OUT013: The visibility of products should not exceed 0.18 and not less than 0.02, it would not affect the sales more. Others, canned and baking goods do goods sales with high visibility
- OUT017: Breakfast with 0.16 visibility shows better sales, so with starchy foods and baking goods. Visibility of any product should not be less than 0.02.
- OUT018: hard drinks could be kept in front shelves as their sales increased a bit when visibility was increased to 0.18.
- OUT019: The visibility is independent sales. Household products are only item whose increased a bit with high visibility. This can also not be sure that by increasing visibility it will increase.

- OUT027: The recommendation for front shelves could snacks foods, others. Otherwise sales are affected by visibility.
- OUT035: Seafoods sales might increase with more visibility. The trend in plot indicates it could improve the sales. Otherwise visibility is not a major factor according to the date given.
- OUT035: The high visibility could be tried to household, breakfast and seafoods which can generate high sales. The visibility should be at least higher than 0.02.
- OUT045: Seafood and breakfast should have higher visibility as their sales are low and high visibility could improve sales.
- OUT046: It is advised to does not low the visibility below 0.02.
- OUT049: Visibility of others and seafoods could as much as 0.16 be high in comparison to other.

In range of 0.02 to 0.18 the visibility does not have any linear relationship. However, above and below that range could decrease the sales. Those items which have good sales can be put at eye-level or waist-level so as to increase their sales to a significant level. Items such as Baking Goods, Breads, Dairy, Canned Foods, Soft Drinks and Health and Hygiene items can be allotted more shelf space so as to increase their sales even more.

4.2 Predictive Analysis

Regression method is used for predictive modelling. Various categorization has been tried to know predict best model and find out the various independent variables effecting the dependent variable, i.e., item sales. The data has been summarized below:

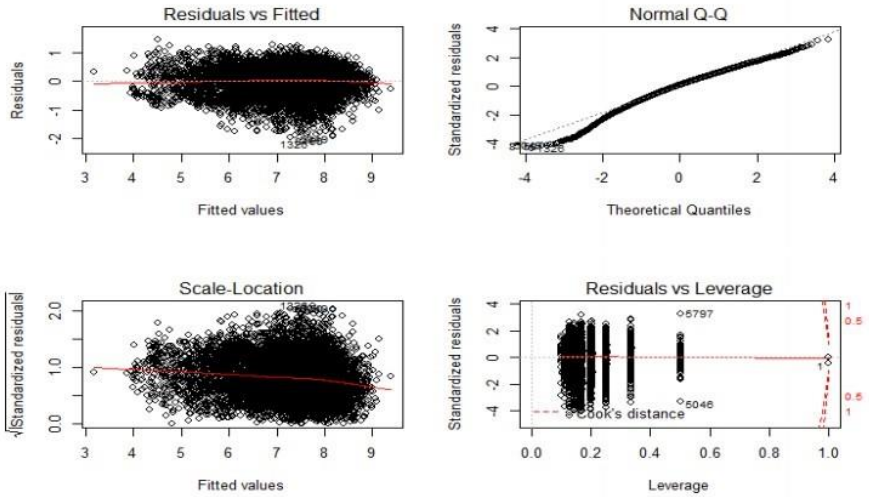
- The data was previously suffering from heteroskedasticity (funnel shaped residual-fitted graph), i.e., error terms did not possess constant variance.
- So, we transformed the Dependent Variable to its log value to make our model ready for regression.
- After applying regression using log, the diagnostic graphs came out to be alright. That means, our model is fulfilling the assumptions of regression (shown below in the diagnostic graphs).

- Multiple R Squared Value- This metric explains the percentage of variance explained by covariates in the model. It ranges between 0 and 1. Usually, higher values are desirable but it rests on the data quality and domain. For example, if the data is noisy, you'd be happy to accept a model at low R^2 values. Ours is coming out to be 0.79 (for the whole data model), which is significant.
- Adjusted R^2– The problem with R^2 is that it keeps on increasing as you increase the number of variables, regardless of the fact that the new variable is actually adding new information to the model. To overcome that, we use adjusted R^2 which doesn't increase (stays same or decrease) unless the newly added variable is truly useful. Our adjusted R^2 is 0.7466.
- F Statistics – It evaluates the overall significance of the model. It is the ratio of explained variance by the model by unexplained variance. It compares the full model with an intercept only (no predictors) model. Its value can range between zero and any arbitrary large number. Naturally, higher the F statistics, better the model. Ours is 16.98 which is a good number.
- Root Mean Squared Error (RMSE)– Error metric is the crucial evaluation number we must check. Since all these are errors, lower the number, better the model. Ours is 0.512.
- It can be seen that p-value of the F-statistic is highly significant i.e. <2.2e-16.

Plots and Summaries

- The first plot is residuals v/s fitted value. It indicates linearity in the data. It should look random, i.e., without any pattern.
- The second plot is normal Q-Q which indicated normal probability graph. It is sued to determine the normal distribution of errors, if it shows straight line then errors are normally distributed. Therefore, in the study the errors are distributed normally.
- The third plot is Scale-Location and used to determine heteroskedasticity. Like the first plot, ideally it should look random, i.e., no patterns.
- The last plot (Cook's distance) tells us which points have the greatest influence on the regression (leverage points).

Whole Eat Easy Data




```
Call:
lm(formula = log(Item_Outlet_Sales) ~ Item_Type + Item_Weight +
    Item_Fat_Content + Item_Visibility + Item_MRP + Outlet_Identifier,
    data = mydata)

Residuals:
     Min       1Q   Median       3Q      Max
-2.30676 -0.29451  0.06842  0.37871  1.35862

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                  4.384e+00  3.960e-02 110.701   <2e-16 ***
Item_TypeBreads              2.813e-02  4.003e-02   0.703    0.482
Item_TypeBreakfast          -6.906e-02  5.554e-02  -1.243    0.214
Item_TypeCanned              2.535e-02  2.990e-02   0.848    0.397
Item_TypeDairy              -6.894e-02  2.964e-02  -2.326    0.020 *
Item_TypeFrozen Foods       -5.427e-02  2.804e-02  -1.935    0.053 .
Item_TypeFruits and Vegetables -4.607e-03  2.618e-02  -0.176    0.860
Item_TypeHard Drinks        -2.206e-02  4.296e-02  -0.514    0.608
Item_TypeHealth and Hygiene  1.100e-02  3.240e-02   0.340    0.734
Item_TypeHousehold          -2.643e-02  2.854e-02  -0.926    0.354
Item_TypeMeat                2.226e-02  3.365e-02   0.661    0.508
Item_TypeOthers              2.181e-03  4.697e-02   0.046    0.963
Item_TypeSeafood             5.687e-03  7.050e-02   0.081    0.936
Item_TypeSnack Foods        -1.439e-03  2.632e-02  -0.055    0.956
Item_TypeSoft Drinks        -2.251e-02  3.342e-02  -0.673    0.501
Item_TypeStarchy Foods      -4.748e-02  4.908e-02  -0.967    0.333
Item_Weight                 -4.212e-04  1.388e-03  -0.303    0.762
Item_Fat_ContentRegular      1.366e-02  1.345e-02   1.016    0.310
Item_Visibility             -5.314e-02  1.185e-01  -0.449    0.654
Item_MRP                     8.316e-03  9.416e-05  88.315   <2e-16 ***
Outlet_IdentifierOUT013      1.933e+00  2.926e-02  66.065   <2e-16 ***
Outlet_IdentifierOUT017      1.992e+00  2.927e-02  68.054   <2e-16 ***
Outlet_IdentifierOUT018      1.785e+00  2.926e-02  61.009   <2e-16 ***
Outlet_IdentifierOUT019      2.989e-02  3.272e-02   0.914    0.361
Outlet_IdentifierOUT027      2.494e+00  2.927e-02  85.225   <2e-16 ***
Outlet_IdentifierOUT035      2.015e+00  2.925e-02  68.863   <2e-16 ***
Outlet_IdentifierOUT045      1.917e+00  2.928e-02  65.484   <2e-16 ***
Outlet_IdentifierOUT046      1.952e+00  2.926e-02  66.702   <2e-16 ***
Outlet_IdentifierOUT049      1.997e+00  2.926e-02  68.243   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5378 on 8494 degrees of freedom
Multiple R-squared:  0.7214,    Adjusted R-squared:  0.7205
F-statistic: 785.4 on 28 and 8494 DF,  p-value: < 2.2e-16
```

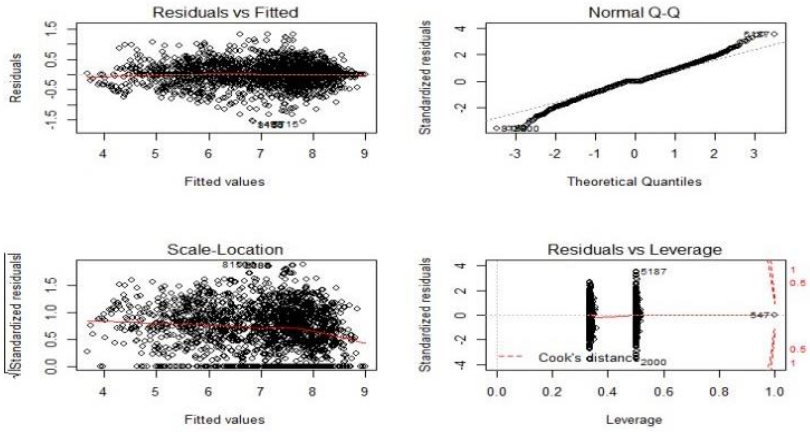
The analysis of whole data can be useful to understand overall situation of the store but in order to understand the problems in detail, according to the location we need categorization of the according to different variables. Following is the categorization of the same.

4.2.2 Prediction for different Categorization

- Advantage:
  a.) More accurate model with higher R2 value.
  b.) We can take predict sales based on different locations and later compare the actual sales with the predicted sales to make effective decisions.
- Different Categorizations are as follows:
  a) **Outlet Locations:** Prediction is done based on different outlet-location types, i.e., Tier 1, Tier 2, Tier 3.
  b) **Outlet Type:** Prediction is done based on different outlet types, i.e., Speciality, Grocery, Convenience and Departmental.
  c) **Outlet Size:** Prediction is done based on different outlet size, i.e., Medium, Small, Large.
  d) **Fat Content:** Prediction is done based on different fat content, i.e., Regular and low fat.

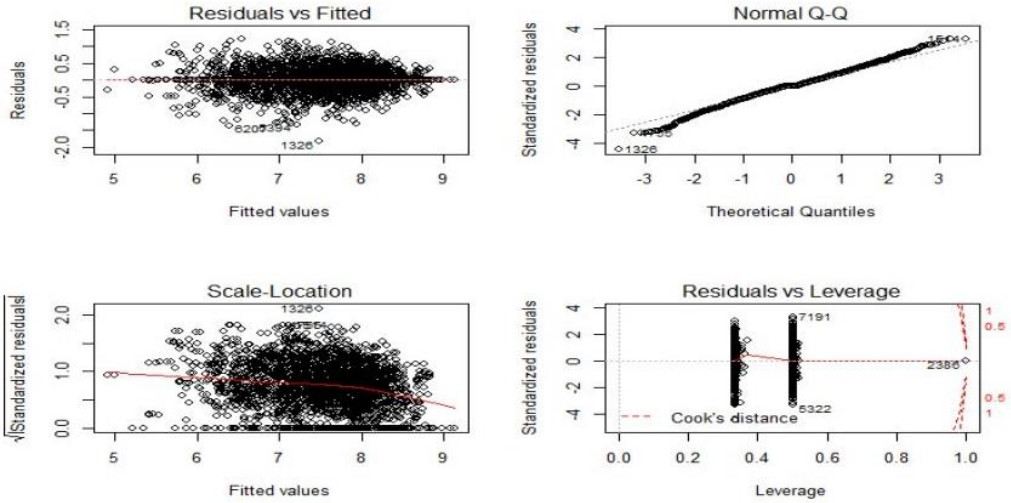
Location-Wise

- Tier 1



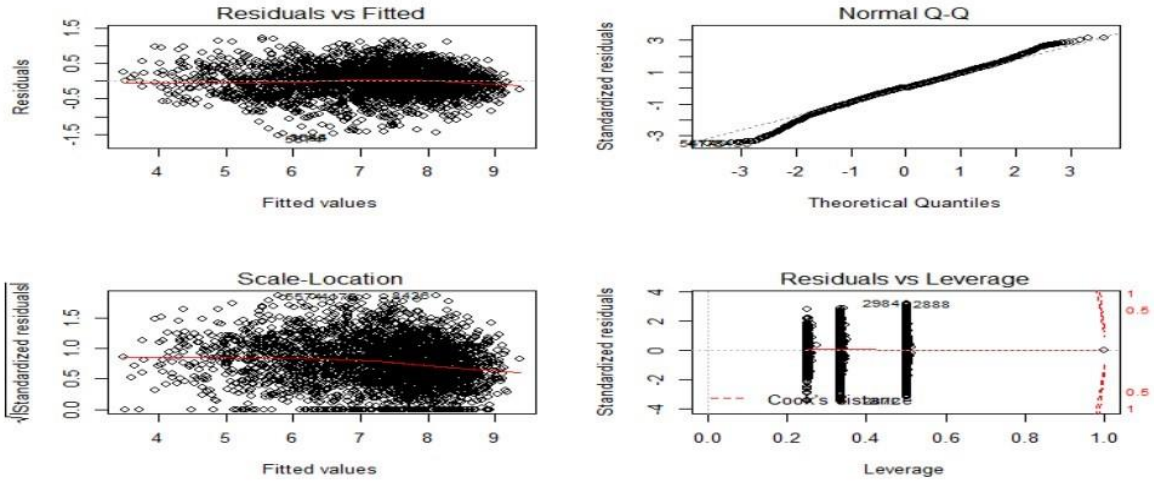

```
Call:
lm(formula = log(Item_Outlet_Sales) ~ Item_Weight + Item_Fat_Content +
    Item_Visibility + Item_Type + Item_MRP + Outlet_Identifier,
    data = tier1)

Residuals:
     Min       1Q   Median       3Q      Max
-2.27204 -0.30731  0.06421  0.39195  1.33979

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                     4.565221   0.065621  69.569   <2e-16 ***
Item_Weight                    -0.003246   0.002746  -1.182   0.2372
Item_Fat_ContentRegular         0.002139   0.025859   0.083   0.9341
Item_Visibility                -0.141002   0.209185  -0.674   0.5003
Item_TypeBreads                -0.012071   0.078154  -0.154   0.8773
Item_TypeBreakfast             -0.075787   0.103628  -0.731   0.4646
Item_TypeCanned                -0.012179   0.057581  -0.212   0.8325
Item_TypeDairy                 -0.138272   0.055799  -2.478   0.0133 *
Item_TypeFrozen Foods          -0.098390   0.053112  -1.853   0.0641 .
Item_TypeFruits and Vegetables -0.077798   0.050304  -1.547   0.1221
Item_TypeHard Drinks           -0.076015   0.083399  -0.911   0.3621
Item_TypeHealth and Hygiene    -0.052844   0.062961  -0.839   0.4014
Item_TypeHousehold             -0.095021   0.054830  -1.733   0.0832 .
Item_TypeMeat                  -0.030067   0.063784  -0.471   0.6374
Item_TypeOthers                -0.136981   0.084546  -1.620   0.1053
Item_TypeSeafood               -0.099830   0.132049  -0.756   0.4497
Item_TypeSnack Foods           -0.067069   0.050365  -1.332   0.1831
Item_TypeSoft Drinks           -0.147284   0.064728  -2.275   0.0230 *
Item_TypeStarchy Foods         -0.063002   0.099894  -0.631   0.5283
Item_MRP                        0.008024   0.000182  44.076   <2e-16 ***
Outlet_IdentifierOUT046         1.917551   0.031503  60.868   <2e-16 ***
Outlet_IdentifierOUT049         1.962276   0.031510  62.275   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.547 on 2366 degrees of freedom
Multiple R-squared:  0.7539,    Adjusted R-squared:  0.7518
F-statistic: 345.2 on 21 and 2366 DF,  p-value: < 2.2e-16
```

- Tier 2




```
Call:
lm(formula = log(Item_Outlet_Sales) ~ Item_Weight + Item_Fat_Content +
    Item_Visibility + Item_Type + Item_MRP + Outlet_Identifier,
    data = tier2)

Residuals:
     Min       1Q   Median       3Q      Max
-2.14094 -0.27449  0.07119  0.36553  1.21239

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                  6.3440751  0.0545631 116.271  < 2e-16 ***
Item_Weight                 -0.0001771  0.0021795  -0.081  0.93523
Item_Fat_ContentRegular      0.0531619  0.0230303   2.308  0.02105 *
Item_Visibility             -0.3622781  0.2253388  -1.608  0.10801
Item_TypeBreads              0.0424309  0.0680191   0.624  0.53280
Item_TypeBreakfast           0.0007404  0.1000560   0.007  0.99410
Item_TypeCanned              0.1005093  0.0506932   1.983  0.04750 *
Item_TypeDairy              -0.0230308  0.0512817  -0.449  0.65339
Item_TypeFrozen Foods       -0.0201121  0.0480910  -0.418  0.67583
Item_TypeFruits and Vegetables  0.0294308  0.0449179  0.655  0.51238
Item_TypeHard Drinks         0.0841538  0.0727945   1.156  0.24776
Item_TypeHealth and Hygiene  0.0614940  0.0558515   1.101  0.27098
Item_TypeHousehold           0.0344715  0.0489992   0.704  0.48180
Item_TypeMeat                0.0110861  0.0596619   0.186  0.85260
Item_TypeOthers              0.0871699  0.0823771   1.058  0.29006
Item_TypeSeafood             0.1630354  0.1180294   1.381  0.16729
Item_TypeSnack Foods         0.0278682  0.0449059   0.621  0.53492
Item_TypeSoft Drinks         0.0283058  0.0560300   0.505  0.61347
Item_TypeStarchy Foods       0.0341199  0.0809833   0.421  0.67355
Item_MRP                     0.0082604  0.0001616  51.106  < 2e-16 ***
Outlet_IdentifierOUT035      0.0224595  0.0244659   0.918  0.35870
Outlet_IdentifierOUT045     -0.0756473  0.0244917  -3.089  0.00203 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5263 on 2763 degrees of freedom
Multiple R-squared:  0.4932,    Adjusted R-squared:  0.4893
F-statistic:   128 on 21 and 2763 DF,  p-value: < 2.2e-16
```

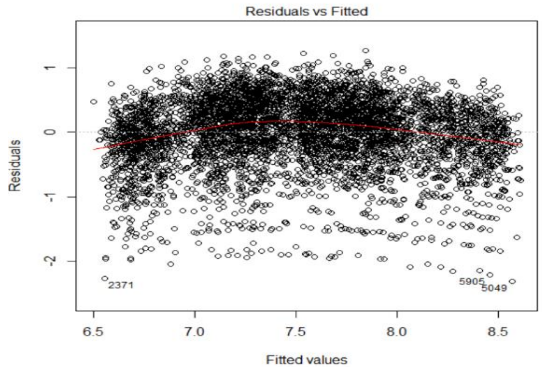
- Tier 3

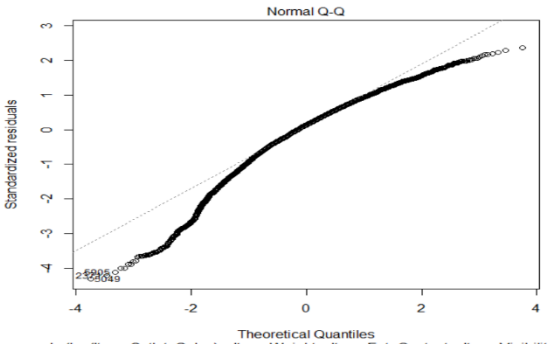


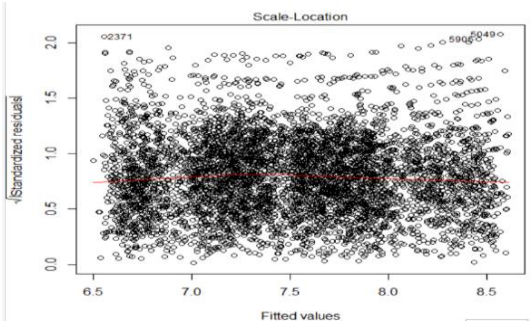

```
Call:
lm(formula = log(Item_Outlet_Sales) ~ Item_Weight + Item_Fat_Content +
    Item_Visibility + Item_Type + Item_MRP + Outlet_Identifier,
    data = tier3)

Residuals:
     Min       1Q   Median       3Q      Max
-2.28282 -0.29772  0.07148  0.37142  1.38515

Coefficients:
                              Estimate Std. Error t value Pr(>|t|)
(Intercept)                  4.2888623  0.0580950  73.825   <2e-16 ***
Item_Weight                  0.0015257  0.0023766   0.642    0.521
Item_Fat_ContentRegular     -0.0090976  0.0215861  -0.421    0.673
Item_Visibility              0.2478669  0.1881800   1.317    0.188
Item_TypeBreads              0.0496792  0.0639534   0.777    0.437
Item_TypeBreakfast          -0.1147991  0.0876047  -1.310    0.190
Item_TypeCanned             -0.0069521  0.0483009  -0.144    0.886
Item_TypeDairy              -0.0554168  0.0478755  -1.158    0.247
Item_TypeFrozen Foods       -0.0510903  0.0453864  -1.126    0.260
Item_TypeFruits and Vegetables  0.0237632  0.0419434   0.567    0.571
Item_TypeHard Drinks        -0.0729030  0.0690252  -1.056    0.291
Item_TypeHealth and Hygiene  0.0200561  0.0513230   0.391    0.696
Item_TypeHousehold          -0.0240832  0.0457246  -0.527    0.598
Item_TypeMeat                0.0609605  0.0531249   1.147    0.251
Item_TypeOthers              0.0518785  0.0779549   0.665    0.506
Item_TypeSeafood            -0.0527906  0.1178252  -0.448    0.654
Item_TypeSnack Foods         0.0243556  0.0424673   0.574    0.566
Item_TypeSoft Drinks         0.0269030  0.0543451   0.495    0.621
Item_TypeStarchy Foods      -0.1023013  0.0783386  -1.306    0.192
Item_MRP                     0.0085812  0.0001505  57.005   <2e-16 ***
Outlet_IdentifierOUT013      1.9453434  0.0300469  64.743   <2e-16 ***
Outlet_IdentifierOUT018      1.7978468  0.0300249  59.879   <2e-16 ***
Outlet_IdentifierOUT027      2.5072247  0.0300906  83.322   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5407 on 3327 degrees of freedom
Multiple R-squared:  0.7675,    Adjusted R-squared:  0.7659
F-statistic: 499.1 on 22 and 3327 DF,  p-value: < 2.2e-16
```

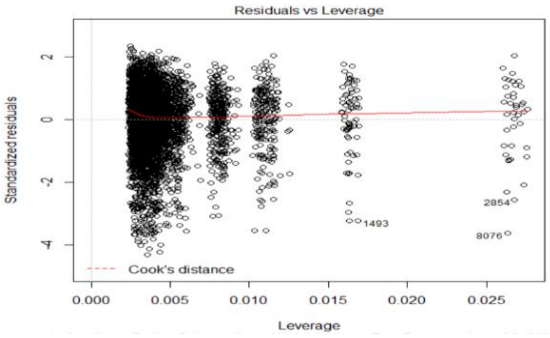
Outlet Store Type

- **Departmental Store**



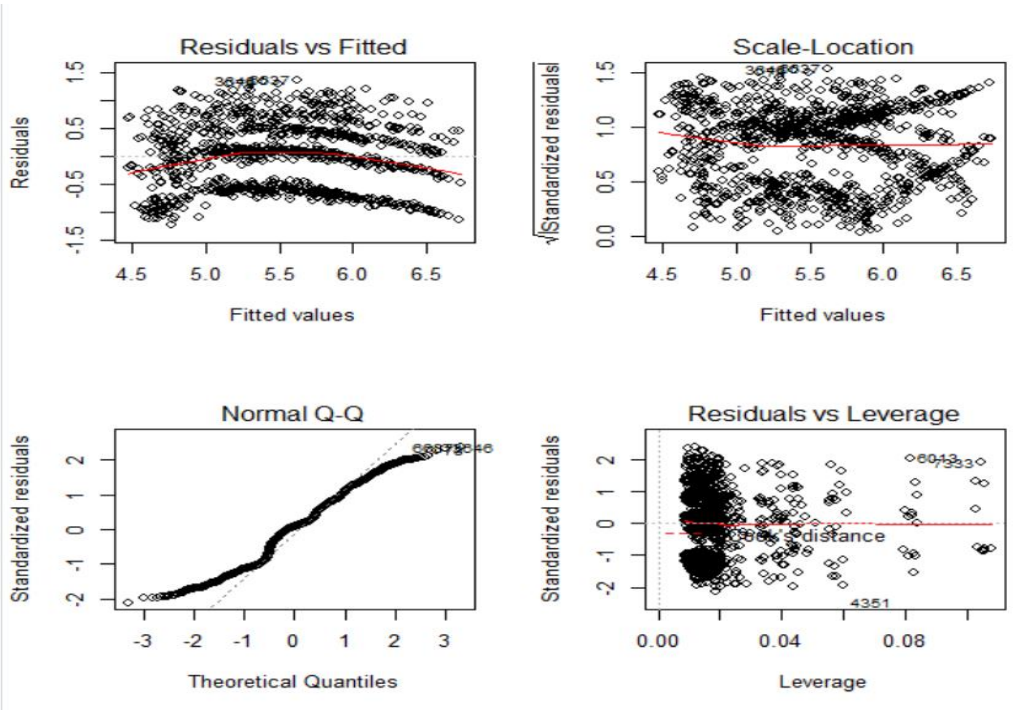






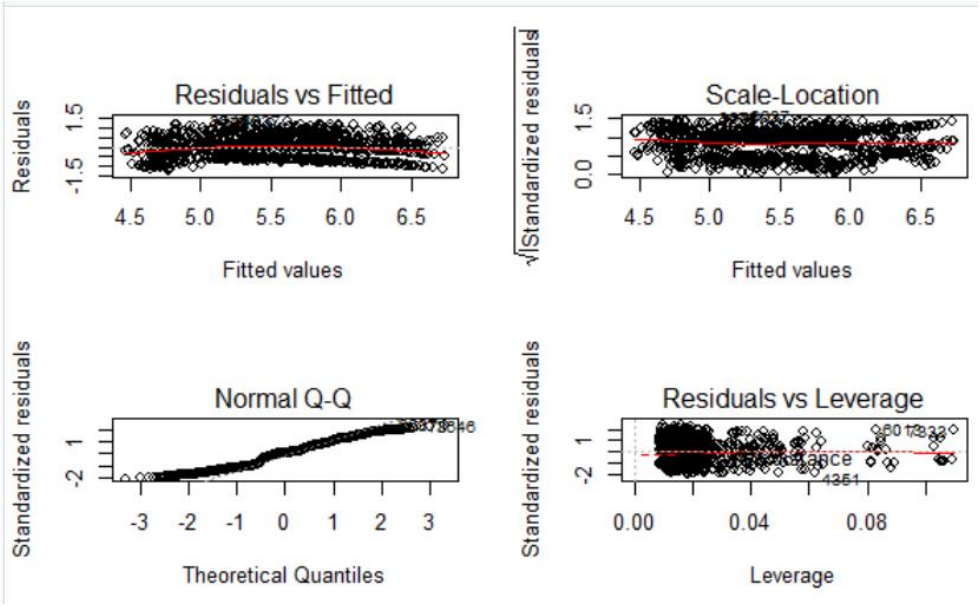

```
Residuals:
     Min       1Q   Median       3Q      Max
-2.30802 -0.27411  0.07281  0.37437  1.26827

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    6.3305077  0.0409531 154.579  < 2e-16 ***
Item_Weight                   -0.0007907  0.0015630  -0.506  0.61297
Item_Fat_ContentRegular        0.0273344  0.0166093   1.646  0.09988 .
Item_Visibility               -0.2326332  0.1622732  -1.434  0.15175
Item_TypeBreads                0.0377124  0.0498517   0.756  0.44939
Item_TypeBreakfast            -0.1092168  0.0701937  -1.556  0.11978
Item_TypeCanned                0.0307459  0.0368224   0.835  0.40377
Item_TypeDairy                -0.0739611  0.0364938  -2.027  0.04274 *
Item_TypeFrozen Foods         -0.0346791  0.0343942  -1.008  0.31336
Item_TypeFruits and Vegetables -0.0103988  0.0322705  -0.322  0.74728
Item_TypeHard Drinks           0.0204543  0.0523361   0.391  0.69594
Item_TypeHealth and Hygiene   -0.0046527  0.0401510  -0.116  0.90775
Item_TypeHousehold            -0.0158717  0.0352303  -0.451  0.65236
Item_TypeMeat                 -0.0159238  0.0424928  -0.375  0.70787
Item_TypeOthers                0.0192427  0.0587258   0.328  0.74317
Item_TypeSeafood               0.0400144  0.0888085   0.451  0.65232
Item_TypeSnack Foods           0.0060531  0.0324280   0.187  0.85193
Item_TypeSoft Drinks          -0.0096110  0.0408735  -0.235  0.81411
Item_TypeStarchy Foods        -0.0055404  0.0588137  -0.094  0.92495
Item_MRP                       0.0082767  0.0001161  71.278  < 2e-16 ***
Outlet_IdentifierOUT017        0.0585481  0.0249103   2.350  0.01879 *
Outlet_IdentifierOUT035        0.0809957  0.0248897   3.254  0.00114 **
Outlet_IdentifierOUT045       -0.0166295  0.0249004  -0.668  0.50426
Outlet_IdentifierOUT046        0.0184969  0.0248861   0.743  0.45736
Outlet_IdentifierOUT049        0.0632432  0.0248834   2.542  0.01106 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5366 on 5552 degrees of freedom
Multiple R-squared:  0.4828,    Adjusted R-squared:  0.4806
F-statistic:   216 on 24 and 5552 DF,  p-value: < 2.2e-16
```

- **Grocery Store**



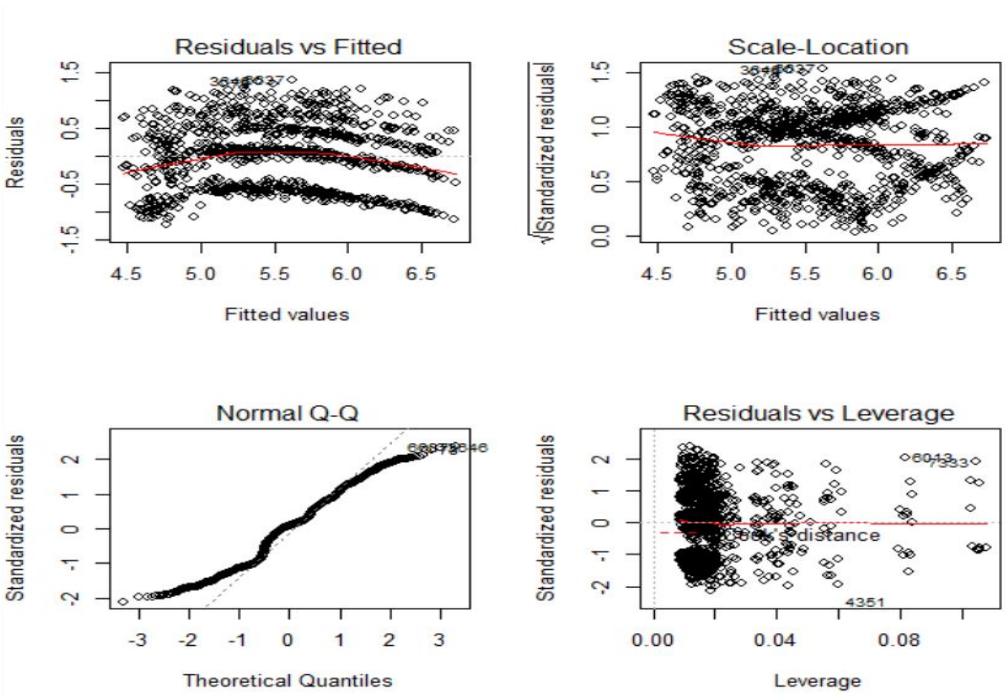

```
Residuals:
     Min       1Q   Median       3Q      Max
-1.22429 -0.56681  0.05085  0.43600  1.36836

Coefficients: (1 not defined because of singularities)
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                     4.292583   0.108517  39.557   <2e-16 ***
Item_Weight                     0.004428   0.005376   0.824    0.410
Item_Fat_ContentRegular        -0.027494   0.041211  -0.667    0.505
Item_Visibility                 0.134683   0.237868   0.566    0.571
Item_TypeBreads                 0.052221   0.119460   0.437    0.662
Item_TypeBreakfast              0.073536   0.147803   0.498    0.619
Item_TypeCanned                 0.057528   0.092993   0.619    0.536
Item_TypeDairy                 -0.085732   0.087800  -0.976    0.329
Item_TypeFrozen Foods          -0.096970   0.085391  -1.136    0.256
Item_TypeFruits and Vegetables -0.016418   0.079103  -0.208    0.836
Item_TypeHard Drinks           -0.181818   0.135981  -1.337    0.181
Item_TypeHealth and Hygiene     0.090196   0.096996   0.930    0.353
Item_TypeHousehold             -0.014823   0.084957  -0.174    0.862
Item_TypeMeat                   0.153283   0.095981   1.597    0.111
Item_TypeOthers                -0.075100   0.130105  -0.577    0.564
Item_TypeSeafood               -0.215697   0.194726  -1.108    0.268
Item_TypeSnack Foods           -0.015879   0.079632  -0.199    0.842
Item_TypeSoft Drinks           -0.018340   0.101948  -0.180    0.857
Item_TypeStarchy Foods         -0.162374   0.173711  -0.935    0.350
Item_MRP                        0.008479   0.000289  29.339   <2e-16 ***
Outlet_IdentifierOUT019         0.028175   0.035553   0.792    0.428
Outlet_Location_TypeTier 3            NA         NA      NA       NA
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5813 on 1062 degrees of freedom
Multiple R-squared:  0.4582,    Adjusted R-squared:  0.448
F-statistic: 44.91 on 20 and 1062 DF,  p-value: < 2.2e-16
```

- **Speciality Store**




```
Call:
lm(formula = log(Item_Outlet_Sales) ~ Item_Weight + Item_Fat_Content +
    Item_Visibility + Item_Type + Item_MRP + Outlet_Identifier +
    Outlet_Size, data = Speciality)

Residuals:
     Min       1Q   Median       3Q      Max
-1.22440 -0.56672  0.04964  0.43752  1.37697

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.2932252  0.1107388  38.769   <2e-16 ***
Item_Weight                    0.0043051  0.0054040   0.797    0.426
Item_Fat_ContentRegular       -0.0275543  0.0412715  -0.668    0.505
Item_Visibility                0.1341072  0.2381518   0.563    0.573
Item_TypeBreads                0.0522367  0.1196013   0.437    0.662
Item_TypeBreakfast             0.0724449  0.1479823   0.490    0.625
Item_TypeCanned                0.0572337  0.0932896   0.614    0.540
Item_TypeDairy                -0.0862448  0.0879408  -0.981    0.327
Item_TypeFrozen Foods         -0.0977249  0.0855095  -1.143    0.253
Item_TypeFruits and Vegetables -0.0164603  0.0792261  -0.208    0.835
Item_TypeHard Drinks          -0.1825135  0.1364763  -1.337    0.181
Item_TypeHealth and Hygiene    0.0898976  0.0970880   0.926    0.355
Item_TypeHousehold            -0.0151311  0.0851421  -0.178    0.859
Item_TypeMeat                  0.1532156  0.0960805   1.595    0.111
Item_TypeOthers               -0.0769605  0.1305123  -0.590    0.556
Item_TypeSeafood              -0.2148837  0.1949377  -1.102    0.271
Item_TypeSnack Foods          -0.0161790  0.0797618  -0.203    0.839
Item_TypeSoft Drinks          -0.0178927  0.1021161  -0.175    0.861
Item_TypeStarchy Foods        -0.1623765  0.1738742  -0.934    0.351
Item_MRP                       0.0084788  0.0002893  29.310   <2e-16 ***
Outlet_IdentifierOUT019        0.0172132  0.0533067   0.323    0.747
Outlet_SizeMedium             -0.0078393  0.0607452  -0.129    0.897
Outlet_SizeSmall               0.0123712  0.0600306   0.206    0.837
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

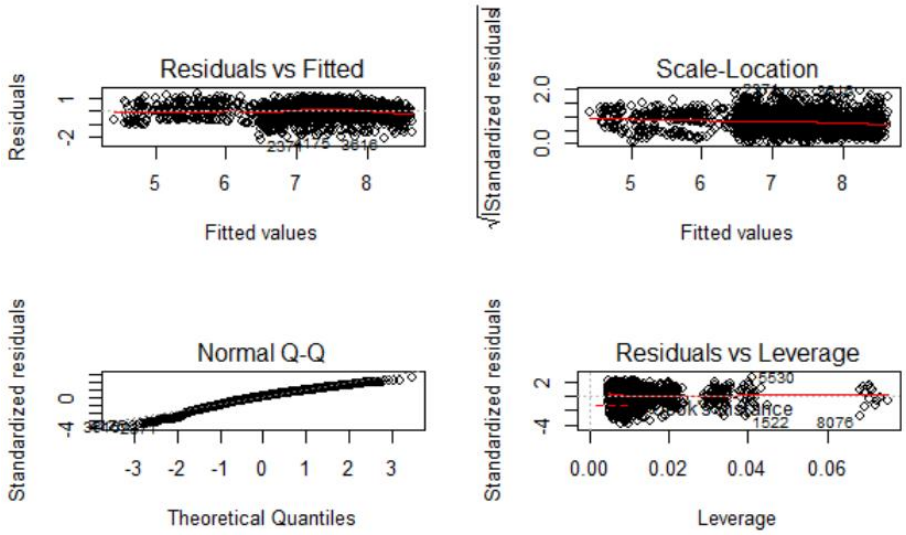
- **Convenience Store**




```
Residuals:
     Min       1Q   Median       3Q      Max
-1.22429 -0.56681  0.05085  0.43600  1.36836

Coefficients: (1 not defined because of singularities)
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                     4.292583   0.108517  39.557   <2e-16 ***
Item_Weight                     0.004428   0.005376   0.824    0.410
Item_Fat_ContentRegular        -0.027494   0.041211  -0.667    0.505
Item_Visibility                 0.134683   0.237868   0.566    0.571
Item_TypeBreads                 0.052221   0.119460   0.437    0.662
Item_TypeBreakfast              0.073536   0.147803   0.498    0.619
Item_TypeCanned                 0.057528   0.092993   0.619    0.536
Item_TypeDairy                 -0.085732   0.087800  -0.976    0.329
Item_TypeFrozen Foods          -0.096970   0.085391  -1.136    0.256
Item_TypeFruits and Vegetables -0.016418   0.079103  -0.208    0.836
Item_TypeHard Drinks           -0.181818   0.135981  -1.337    0.181
Item_TypeHealth and Hygiene     0.090196   0.096996   0.930    0.353
Item_TypeHousehold             -0.014823   0.084957  -0.174    0.862
Item_TypeMeat                   0.153283   0.095981   1.597    0.111
Item_TypeOthers                -0.075100   0.130105  -0.577    0.564
Item_TypeSeafood               -0.215697   0.194726  -1.108    0.268
Item_TypeSnack Foods           -0.015879   0.079632  -0.199    0.842
Item_TypeSoft Drinks           -0.018340   0.101948  -0.180    0.857
Item_TypeStarchy Foods         -0.162374   0.173711  -0.935    0.350
Item_MRP                        0.008479   0.000289  29.339   <2e-16 ***
Outlet_IdentifierOUT019         0.028175   0.035553   0.792    0.428
Outlet_Location_TypeTier 3            NA         NA      NA       NA
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5813 on 1062 degrees of freedom
Multiple R-squared:  0.4582,    Adjusted R-squared:  0.448
F-statistic: 44.91 on 20 and 1062 DF,  p-value: < 2.2e-16
```

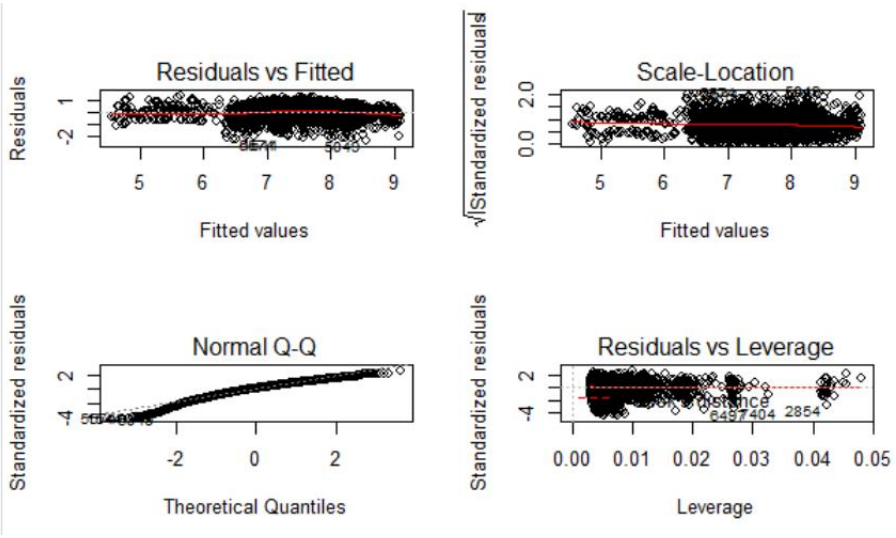
Outlet Size

- **Large**



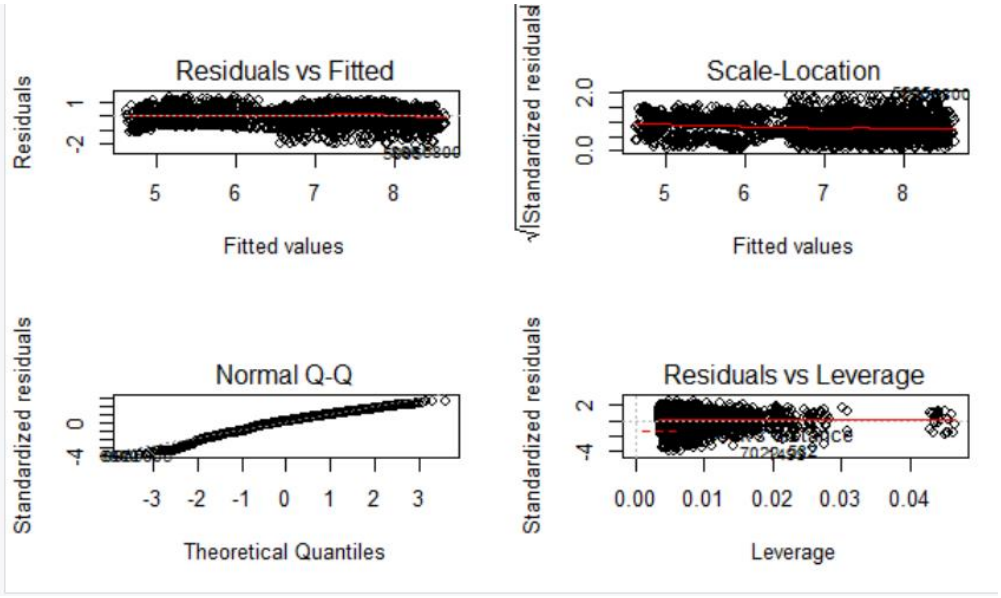

```
Residuals:
     Min       1Q   Median       3Q      Max
-2.20800 -0.30370  0.08092  0.39175  1.38951

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.3543066  0.0758508  57.406  < 2e-16 ***
Item_Weight                   -0.0022315  0.0027318  -0.817  0.41411
Item_Fat_ContentRegular        0.0227696  0.0289479   0.787  0.43163
Item_Visibility                0.2259986  0.2568896   0.880  0.37910
Item_TypeBreads               -0.0114508  0.0823205  -0.139  0.88938
Item_TypeBreakfast            -0.3241263  0.1167794  -2.776  0.00556 **
Item_TypeCanned               -0.0004785  0.0650579  -0.007  0.99413
Item_TypeDairy                -0.0949131  0.0636698  -1.491  0.13620
Item_TypeFrozen Foods         -0.0664185  0.0598572  -1.110  0.26730
Item_TypeFruits and Vegetables -0.0140699  0.0558825  -0.252  0.80124
Item_TypeHard Drinks          -0.0255887  0.0896562  -0.285  0.77536
Item_TypeHealth and Hygiene   -0.0474692  0.0679937  -0.698  0.48517
Item_TypeHousehold            -0.0788625  0.0610528  -1.292  0.19661
Item_TypeMeat                  0.0241771  0.0724307   0.334  0.73857
Item_TypeOthers                0.0343313  0.1095313   0.313  0.75398
Item_TypeSeafood              -0.3722076  0.1511940  -2.462  0.01391 *
Item_TypeSnack Foods           0.0118753  0.0564630   0.210  0.83344
Item_TypeSoft Drinks           0.0646379  0.0723467   0.893  0.37173
Item_TypeStarchy Foods        -0.0460683  0.1037856  -0.444  0.65718
Item_MRP                       0.0086298  0.0002010  42.925  < 2e-16 ***
Outlet_IdentifierOUT013        1.9383182  0.0416441  46.545  < 2e-16 ***
Outlet_IdentifierOUT017        1.9792572  0.0465159  42.550  < 2e-16 ***
Outlet_IdentifierOUT045        1.9113618  0.0462240  41.350  < 2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5583 on 1975 degrees of freedom
Multiple R-squared:  0.6956,    Adjusted R-squared:  0.6923
F-statistic: 205.2 on 22 and 1975 DF,  p-value: < 2.2e-16
```

- **Medium**




```
Residuals:
     Min       1Q   Median       3Q      Max
-2.29198 -0.28179  0.06321  0.35779  1.35648

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.3108179  0.0659202  65.394   <2e-16 ***
Item_Weight                    0.0027818  0.0022541   1.234   0.2172
Item_Fat_ContentRegular       -0.0029531  0.0203485  -0.145   0.8846
Item_Visibility                0.0691021  0.1941442   0.356   0.7219
Item_TypeBreads               -0.0042719  0.0621792  -0.069   0.9452
Item_TypeBreakfast            -0.0470501  0.0880230  -0.535   0.5930
Item_TypeCanned                0.0129717  0.0453560   0.286   0.7749
Item_TypeDairy                -0.0601217  0.0455451  -1.320   0.1869
Item_TypeFrozen Foods         -0.0789171  0.0433595  -1.820   0.0688 .
Item_TypeFruits and Vegetables 0.0201149  0.0396037   0.508   0.6116
Item_TypeHard Drinks          -0.0372855  0.0629936  -0.592   0.5540
Item_TypeHealth and Hygiene    0.0311430  0.0489478   0.636   0.5247
Item_TypeHousehold             0.0153764  0.0436258   0.352   0.7245
Item_TypeMeat                  0.0383628  0.0505891   0.758   0.4483
Item_TypeOthers                0.0846805  0.0739581   1.145   0.2523
Item_TypeSeafood               0.0369545  0.1083755   0.341   0.7331
Item_TypeSnack Foods          -0.0043130  0.0398780  -0.108   0.9139
Item_TypeSoft Drinks          -0.0301967  0.0510102  -0.592   0.5539
Item_TypeStarchy Foods        -0.0798980  0.0753365  -1.061   0.2890
Item_MRP                       0.0083422  0.0001432  58.272   <2e-16 ***
Outlet_IdentifierOUT017        2.0046152  0.0539730  37.141   <2e-16 ***
Outlet_IdentifierOUT018        1.8056426  0.0462211  39.065   <2e-16 ***
Outlet_IdentifierOUT027        2.5148328  0.0462700  54.351   <2e-16 ***
Outlet_IdentifierOUT045        1.9515155  0.0549448  35.518   <2e-16 ***
Outlet_IdentifierOUT049        2.0170818  0.0462180  43.643   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5169 on 3401 degrees of freedom
Multiple R-squared:  0.6643,    Adjusted R-squared:  0.6619
F-statistic: 280.4 on 24 and 3401 DF,  p-value: < 2.2e-16
```

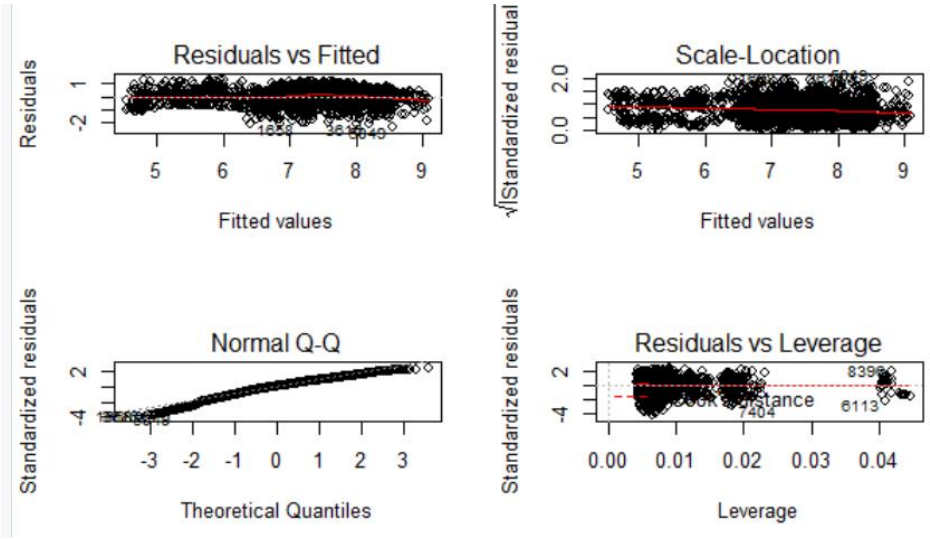
- **Small**




```
Residuals:
     Min       1Q   Median       3Q      Max
-2.18362 -0.30860  0.07206  0.39115  1.34751

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.4720563  0.0703033  63.611   <2e-16 ***
Item_Weight                   -0.0024053  0.0023254  -1.034   0.3010
Item_Fat_ContentRegular        0.0216129  0.0227207   0.951   0.3416
Item_Visibility               -0.3241091  0.1851325  -1.751   0.0801 .
Item_TypeBreads                0.0933882  0.0676990   1.379   0.1679
Item_TypeBreakfast             0.0700147  0.0906788   0.772   0.4401
Item_TypeCanned                0.0569792  0.0499401   1.141   0.2540
Item_TypeDairy                -0.0626549  0.0491853  -1.274   0.2028
Item_TypeFrozen Foods         -0.0222953  0.0464535  -0.480   0.6313
Item_TypeFruits and Vegetables -0.0246571  0.0443887  -0.555   0.5786
Item_TypeHard Drinks           0.0019146  0.0773196   0.025   0.9802
Item_TypeHealth and Hygiene    0.0254676  0.0556640   0.458   0.6473
Item_TypeHousehold            -0.0387122  0.0477792  -0.810   0.4179
Item_TypeMeat                  0.0028002  0.0572233   0.049   0.9610
Item_TypeOthers               -0.0845137  0.0733259  -1.153   0.2492
Item_TypeSeafood               0.2087678  0.1170116   1.784   0.0745 .
Item_TypeSnack Foods          -0.0042631  0.0444028  -0.096   0.9235
Item_TypeSoft Drinks          -0.0646398  0.0556456  -1.162   0.2455
Item_TypeStarchy Foods        -0.0256809  0.0824280  -0.312   0.7554
Item_MRP                       0.0081128  0.0001593  50.938   <2e-16 ***
Outlet_IdentifierOUT017        1.9959140  0.0552533  36.123   <2e-16 ***
Outlet_IdentifierOUT019        0.0190217  0.0497629   0.382   0.7023
Outlet_IdentifierOUT035        1.9910496  0.0477766  41.674   <2e-16 ***
Outlet_IdentifierOUT045        1.8995532  0.0550145  34.528   <2e-16 ***
Outlet_IdentifierOUT046        1.9287031  0.0477710  40.374   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.546 on 3074 degrees of freedom
Multiple R-squared:  0.7585,    Adjusted R-squared:  0.7566
F-statistic: 402.2 on 24 and 3074 DF,  p-value: < 2.2e-16
```

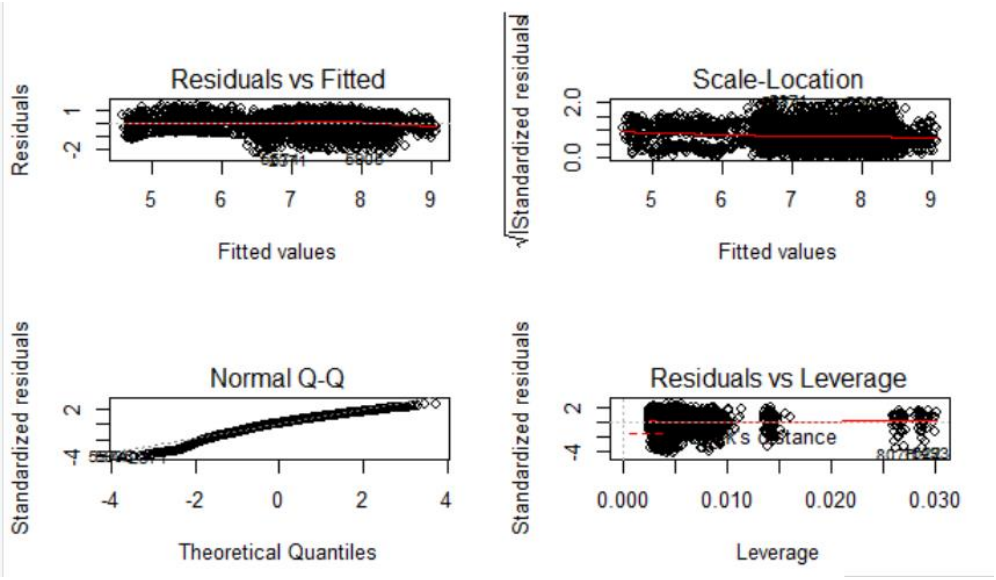
Fat Content

- **Regular**




```
Residuals:
     Min       1Q   Median       3Q      Max
-2.29271 -0.28297  0.06149  0.37359  1.29713

Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.3788297  0.0629798  69.528   <2e-16 ***
Item_Weight                    0.0009840  0.0023493   0.419   0.6754
Item_Visibility               -0.3264398  0.1956165  -1.669   0.0953 .
Item_TypeBreads               -0.0447782  0.0590271  -0.759   0.4481
Item_TypeBreakfast            -0.0942125  0.0708949  -1.329   0.1840
Item_TypeCanned               -0.0142349  0.0427174  -0.333   0.7390
Item_TypeDairy                -0.0542828  0.0445850  -1.218   0.2235
Item_TypeFrozen Foods         -0.0587995  0.0399931  -1.470   0.1416
Item_TypeFruits and Vegetables -0.0057471  0.0372344  -0.154   0.8773
Item_TypeMeat                  0.0201797  0.0449051   0.449   0.6532
Item_TypeSeafood               0.0241836  0.1074584   0.225   0.8220
Item_TypeSnack Foods          -0.0346377  0.0381505  -0.908   0.3640
Item_TypeSoft Drinks          -0.1227833  0.0700552  -1.753   0.0798 .
Item_TypeStarchy Foods         0.0246556  0.0722005   0.341   0.7328
Item_MRP                       0.0083738  0.0001584  52.876   <2e-16 ***
Outlet_IdentifierOUT013        1.9371745  0.0490176  39.520   <2e-16 ***
Outlet_IdentifierOUT017        2.0414676  0.0488509  41.790   <2e-16 ***
Outlet_IdentifierOUT018        1.7880086  0.0488338  36.614   <2e-16 ***
Outlet_IdentifierOUT019        0.0556336  0.0549404   1.013   0.3113
Outlet_IdentifierOUT027        2.5320155  0.0489360  51.741   <2e-16 ***
Outlet_IdentifierOUT035        2.0314888  0.0490938  41.380   <2e-16 ***
Outlet_IdentifierOUT045        1.9720896  0.0491593  40.116   <2e-16 ***
Outlet_IdentifierOUT046        2.0104355  0.0488758  41.134   <2e-16 ***
Outlet_IdentifierOUT049        1.9901703  0.0487432  40.830   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.5332 on 2982 degrees of freedom
Multiple R-squared:  0.7336,    Adjusted R-squared:  0.7315
F-statistic: 356.9 on 23 and 2982 DF,  p-value: < 2.2e-16
```

- **Low Fat**




```
Coefficients:
                                Estimate Std. Error t value Pr(>|t|)
(Intercept)                    4.3996432  0.0506412  86.879   <2e-16 ***
Item_Weight                   -0.0014652  0.0017340  -0.845    0.398
Item_Visibility                0.0806017  0.1497235   0.538    0.590
Item_TypeBreads                0.0866950  0.0545286   1.590    0.112
Item_TypeBreakfast            -0.0322486  0.0897036  -0.360    0.719
Item_TypeCanned                0.0556865  0.0418466   1.331    0.183
Item_TypeDairy                -0.0751772  0.0399667  -1.881    0.060 .
Item_TypeFrozen Foods         -0.0497896  0.0392625  -1.268    0.205
Item_TypeFruits and Vegetables -0.0058404  0.0368006  -0.159    0.874
Item_TypeHard Drinks          -0.0127703  0.0475414  -0.269    0.788
Item_TypeHealth and Hygiene    0.0235022  0.0381133   0.617    0.537
Item_TypeHousehold            -0.0136790  0.0349442  -0.391    0.695
Item_TypeMeat                  0.0165526  0.0510836   0.324    0.746
Item_TypeOthers                0.0153000  0.0511809   0.299    0.765
Item_TypeSeafood               0.0016112  0.0937171   0.017    0.986
Item_TypeSnack Foods           0.0246204  0.0364732   0.675    0.500
Item_TypeSoft Drinks           0.0058996  0.0408707   0.144    0.885
Item_TypeStarchy Foods        -0.1045688  0.0669050  -1.563    0.118
Item_MRP                       0.0082644  0.0001184  69.790   <2e-16 ***
Outlet_IdentifierOUT013        1.9312418  0.0365120  52.893   <2e-16 ***
Outlet_IdentifierOUT017        1.9639597  0.0365938  53.669   <2e-16 ***
Outlet_IdentifierOUT018        1.7831535  0.0365933  48.729   <2e-16 ***
Outlet_IdentifierOUT019        0.0133936  0.0407579   0.329    0.742
Outlet_IdentifierOUT027        2.4727154  0.0365586  67.637   <2e-16 ***
Outlet_IdentifierOUT035        2.0037141  0.0364731  54.937   <2e-16 ***
Outlet_IdentifierOUT045        1.8859426  0.0364705  51.711   <2e-16 ***
Outlet_IdentifierOUT046        1.9189585  0.0365697  52.474   <2e-16 ***
Outlet_IdentifierOUT049        1.9995204  0.0366172  54.606   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.54 on 5489 degrees of freedom
Multiple R-squared:  0.7158,    Adjusted R-squared:  0.7144
F-statistic: 512.1 on 27 and 5489 DF,  p-value: < 2.2e-16
```

4.3.2 Results

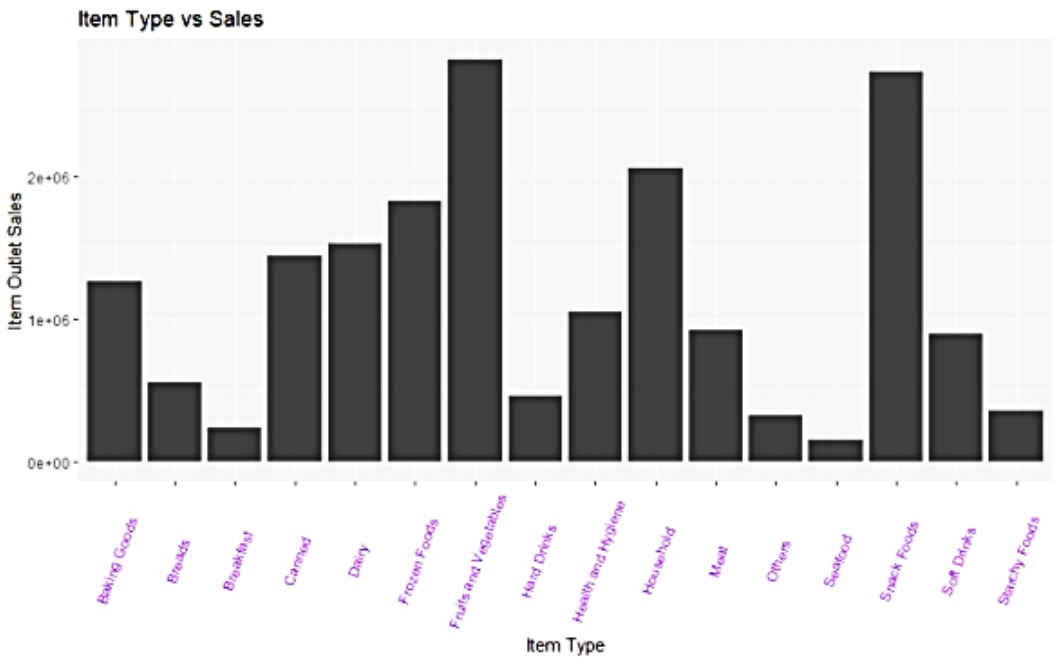
The below table gives summary of the analysis and indicates what all variables are useful in the best fit model.

Tables 7.1 Different variables wise categorization regression

Variables Considered		R^2	Adjusted R^2
Item type, Item weight, Item fat content, Item visibility, Item MRP, Outlet Identifier		0.7214	0.7205
Location Wise:	a.) Tier 1	0.7539	0.7518
	b.) Tier 2	0.4932	0.4893
	c.) Tier 3	0.7675	0.7659
Outlet type wise:	a.) Departmental	0.4828	0.4806
	b.) Specialty	0.4764	0.4655
	c.) Convenience	0.5634	0.5548
	d.) Grocery	0.4582	0.4480
Outlet size wise:	a.) Large	0.6956	0.6953
	b.) Medium	0.6643	0.6619
	c.) Small	0.7585	0.7566
Fat content wise	a.) Regular	0.7336	0.7315
	b.) Low Fat	0.7158	0.7144

4.3 Shelf Spacing

The location of a product in a shop can make a crucial difference to its sales. Manufacturers are no longer content merely to book an order with the retailer. They train their salesmen to ensure that their product is on display with maximum visibility to the shopper. A recent study in national supermarkets confirms that the way products are shelfed affects consumer purchasing behaviour Traditionally, "eye-level" shelving is best followed by "waist-level", "knew-level" and "ankle-level" it is near impossible to locate all the items at eye-level and store experience have proved that consumer responses to shelf locations depend upon such other factors as the product package size, whether or not it's being advertised, its need for visibility and intended market segment. In the middle range of shelving heights visibility variation becomes the major influence on product sales.



- Those items which have good sales can be put at eye-level or waist-level so as to increase their sales to a significant level.
- Items such as Baking Goods, Breads, Dairy, Canned Foods, Soft Drinks and Health and Hygiene items can be allotted more shelf space so as to increase their sales even more.

CHAPTER 5: CONCLUSION

Major attributes are found in the above study that are affecting item sales of a multi-chain retail store. The methodology adopted descriptive modelling using tableau and predictive modelling using R studio. According to Muhamad Jantan and Abdul Razak Kamaruddin, location and price are the most important attributes for the store choice by customers.

In this study similar results are present that there are six major factors that effects the sales. These factors include item visibility, item type, item fat content, outlet identifier, item weight and item MRP. The study will help strategists and retailers to plan and formulate strategies which will increase outlet sales and will help in inventory controls.

- Size of store: Medium size stores having highest sale and large sized have least sales.
- Location of store: In total tier 3 have highest sales and tier 1 having lowest sales.
- Type of product: Different products have different sales, highest being fruits and vegetables and lowest being seafoods.
- Type of store: Departmental store in tier 1 and 2 and convenience store tier 3 have maximum sales. Grocery stores have lowest sales.
- Weight of product: Firstly, sales increased with increase in weight of a particular product after a point, i.e., 12.86 in most cases in starts decreasing.
- Fat content: Low fat products sold more than regular fat products in all type of stores and in all tier cities.

CHAPTER 6: RECOMMENDATIONS

According to the above analysis, I recommend the following to the multi chain store:

- Low fat products should be kept more in number because people are becoming more conscious about their health and preferring low fat content food samples specially in tier 1 cities.
- The company should stock item of weight around 12 to 13 kg in general.
- The front part of shelf space should be occupied by items generating more sales, i.e., fruits and vegetables then snack and then household items and so on.
- The expansion of stores generating high revenue, i.e., departmental stores and convenience stores.
- Expansion of more medium and small stores as they generate more revenue.
- Increased assortment of products by following:
    - The few varieties of products can be increased to keep in stores which are already high in sales in medium and large sized stores.
    - Many variations of a particular product can also be added in small sized stored
    - By grouping together items that they believe would appeal to certain types of customers, retailers may fine-tune their assortment strategies to target consumers' demographic profiles. Example new parents for infant apparels.
    - A strategically arranged product assortment can upsell customers on supplemental items as they search for the thing that brought them to the store.
- Grouping related items together strategically, whether or not they are necessities, is a common way to stimulate impulse buying. Example bread with butter.
- The sales in different tier cities are different, therefore as per the tier of the city the store should be expanded. In tier 1 departmental is maximum; In tier 2 departmental is maximum; In tier 3 convenience is maximum.

In addition to the above the company should:

1. The item visibility needs to be monitored to organize shelf spacing as it shows positive relationship with most of the items kept at waist or eye level. From the research this can be determined that establishment year have no effect on outlet sales. For inventor fruits and vegetable, snack foods are of maximum sale and seafoods and breakfast generate minimum sales so should be kept in minimum quantity or else could be avoided according to the outlet.

2. Departmental stores are much more popular among different type of cities and grocery store is least favorable. Tier 2 location generates maximum revenue. Convenience and specialty stores are popular in their respective locations only and could be encouraged in other locations as well. Medium and small sized stores are preferred more because generate maximum sales with minimum management cost.

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