

# Data Exploration in the Supermarket System to Study the Behavior of the Jordanian Consumers

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**Abstract:** The study aimed to identify the extent of using data exploration in the supermarket system to study the behavior of the Jordanian consumers and the extent of using data exploration in commercial shops in Jordan. The study concluded that data exploration in the supermarket system is not used to study the behavior of the Jordanian consumers regarding the disclosure of products sold in the consumer basket. The results of the study showed that there is a use of data exploration in the supermarket system to study the behavior of the Jordanian consumers regarding the disclosure of best-selling products in a specified period. The study also showed that there is a use of data exploration in the super system to study the behavior of the Jordanian consumer regarding the exploration of consumer's behavior towards the product quality. The most important recommendations of the study is the need for further studies in the use of data exploration in the supermarket system to study the behavior of the consumers, especially as most shops use a system to handle sales movements, but there is not enough exploitation of the database, which can help significantly in studying the consumer's behavior.

**Keywords:** Data Exploration, Supermarket System, Consumers Behavior

## Introduction

Data exploration is a type of methods analysis based on data maintained by the organization. These rules rely on hidden models of data collection to be used to predict the future behavior of the organization. This prediction helps retailers in how to reveal their customers as well as learn about their common interests (Storey and Song, 2017). The purpose of the data exploration program is not to disclose what has been done previously, but to pre-screen the unusual relations between the data items and thus harness the results of such disclosure in favor of the objectives of the concerned organization. Data exploration tools are used for the purpose of detecting works with their multiple capabilities through data work surveys (Abdel-Basset *et al.*, 2018). Through the tools of exploration and the results of their uses, it is possible to identify some links of normal values from the point of view of the concerned organization (Lu *et al.*, 2017). Databases are the basic stores that support the structure of businesses and support them in their activities towards their last goals. In order to benefit from these stores, it is

necessary to address what is stored in it and analyze it to find out the relationships between the data that lead to meaningful and useful information and knowledge content. Data exploration techniques lead us to a level of understanding that helps us discover knowledge from databases (Moro *et al.*, 2016). Data exploration can be described as a process of treating and processing data using statistical and mathematical systems, methods, artificial intelligence processes and self-learning techniques to extract useful information and obtain future knowledge from the data store (Coussement *et al.*, 2017).

On the other hand, the data exploration process leads to access data that could not have been obtained without prospecting, which has evolved conceptually to include all the automatic types of data analysis. Data exploration covers the case of mathematical processing of large amounts of data (Hudaib *et al.*, 2015). These mathematical models are laws, relationships and trends that describe what we can predict in the future through the analysis process (Jahromi *et al.*, 2016). The data exploration process is compatible with the data of computer science and statistics, with the use of advanced techniques across both fields to

carry out the process of extracting information from the databases (Kumar and Muneeswaran, 2013).

Data exploration in the business world helps to identify consumer's behavior, as the processes of understanding and defining the consumer form (Babu and Bhuvanewari, 2012). These processes help business organizations in several areas, including the formation of business strategies. The development of organizational development programs, the contribution to identifying market opportunities and other matters that ultimately prevent the presence of organizations in the market (Nurfadhina *et al.*, 2016). It is well known that organizations and public organizations have a large amount of data and information that can be used to chart the dimensions of consumer behavior. Adding after consumer analysis a further depth of understanding consumer interactions and relationships. Data prospecting activities can cover forecasting of potential sales and estimating storage levels (Martin, 2017).

The importance of the study comes from the fact that it deals with the use of data exploration in the supermarket system to study the behavior of the Jordanian consumers, an attempt to answer the questions and outstanding topics related to data exploration and its importance to study consumers behavior (Lomax and Vadera, 2017). In addition, to the fact that subject of data exploration has become a source of interest in the present time, especially as organizations are always seeking for development and innovation. Data exploration is one of the main means that lead these organizations to the top in the presence of great competition by helping to analyze consumer behavior (Hussain *et al.*, 2017).

Therefore, the main objective of the study is to show the extent to which data exploration is used in the supermarket system and to study the Jordanian consumer's behavior as well as the extent to which data exploration is used in shops, This study contributes to the existing literature by improving and extending the earlier studies in four dimensions to discuss the extent to which supermarkets rely on data exploration. First, to explore products sold in the consumer basket. Second, identify Best-sold products in a specified period. Third, rush of the consumer towards offers. Fourth, explore consumer behavior toward product quality.

## Literature Review

The previous studies dealt with the subject of data exploration in the supermarket system to study the behavior of the consumers on more than one side. (Jelly and Mohamed, 2017) dealt with exploring the data of shops by the rule of correlation, where this study aimed to find the correlations between the sales of goods using the analysis of the basket of customers to know the basic products that are purchased by customers, which are not purchased at times and can be used in better store layouts and identify customer buying

patterns. The main objective of this study is to identify customer purchase patterns (from supermarkets) in Sudan, Khartoum City.

The problem of the study is how to identify the types of goods purchased by the consumer to take advantage of them in order to achieve the wishes of customers, to achieve the objectives of the study, the study used the rules of correlation (a priori algorithm) on the transaction data collected specifically for this study and these data, collected from shops, use computerized systems and other shops use manual buying and selling system. These combined transaction data provide us with valuable information on common facts and joint product purchases. This information can be used as a basis for making decisions on marketing activity such as promotional support, inventory control and cross-selling campaigns. At the end of this study, the researchers discovered and identified the best 24 Sudanese purchase patterns when buying from supermarkets. Among the obtained results, the researchers found that meat, flour and bread are the most sold commodities and they are the basic commodities in the region.

Wang and Yue (2017) Aimed to propose a pre-warning system for food safety, based on data exploration and Internet technology base, to monitor all data detection and pre-alarm automatically in time. The aim of the pre-warning system is to help managers in the food industry to find food safety risks in advance and to give some decision to support information to maintain the quality and safety of food products. A case study of a dairy producer was conducted. The results showed that a pre-warning system could effectively determine safety risks and accurately determine whether a warning should be issued, based on expert analysis when a faulty system is detected. In addition, the implications of the proposed approach were discussed as well as suggestions for future action were outlined.

As for the study of (Altuntas, 2017), a novel approach based on utility exploration for store layout, the purpose of this study is to propose a new approach based on prospecting facilities for store planning. The data exploration algorithm based on the prospecting tool is used in this study. A realistic case study was conducted in a supermarket to illustrate the proposed approach. The results indicated that the proposed approach could be used easily and efficiently to arrange store planning. A new approach to commercial intelligence in retail was proposed. The proposed approach uses a utility-based data exploration methodology, the highly useful HUIM algorithm, to rearrange the store design and identify relationships between product families. The quantities and prices purchased compared to the product families are taken into account in the proposed approach to addressing needs in practice. The Business Intelligence program was developed as an integral part of the proposed approach to utilize the HUIM algorithm.

The study of (Shelke *et al.*, 2017), Data Exploration for Supermarket Sale Analysis Using Association Rule, the study revealed that data exploration is a new technique for discovering important information from a data warehouse that is widely used in almost all areas. Database extraction is necessary because of the increasing number of data exploration due to its widespread applicability in the retail industries in improving marketing strategies. Analysis of previous transaction data can provide very valuable information about customer behavior and business decisions, the size of stored data increases rapidly to the speed of the fastest processor available for analysis and its main purpose is to find the correlation relationship between a large numbers of database elements. It is used to describe customer buying patterns in the supermarket.

As for the study of (Kaur and Singh, 2018), An-Enhanced Data Exploration Technique to Improve the CRM Using Association Rule Exploration, it includes association rules that help to establish correlation between groups of elements in the transaction database. The most famous algorithm in prospecting is the use of "Apriori" to discover knowledge. The proposed work is based on the establishment of rules of association in view of the multiplicity of attributes and the reduction of computation time that will increase efficiency. Improved work will improve the current Apriori algorithm and will reduce some of the flaws of the current algorithm.

A study of (Kaur and Kaur, 2017) Data Mining in Supermarket: A Survey confirmed that one of the most stimulating areas of research is the extraction of data, which is becoming increasingly popular in supermarket analysis. To discover new trends, exploration plays an important role in supermarket analysis, which is beneficial to all parties involved in this area. The data extraction consists of artificial intelligence, automated learning and database management to extract new patterns of massive data sets and knowledge associated with these patterns. Therefore, we can use data extraction in the supermarket application, through which supermarket management is transformed into knowledge management.

As for the study of exploration shopping data with passive tags via speed analysis, (Zhao *et al.*, 2018), it confirmed that it is difficult for the actual store to collect customer shopping data during the shopping process and to conduct deep data exploration operations, as opposed to online shopping. The current methods of solving this problem concern only how data is collected and analyzed, but it does not care about the large amount of account, the amount of collected data and the long delay, as it cannot provide user feedback in a timely and effective manner.

The signal strength received from the RFID tags that can be used to carry out on-site shopping data exploration, such as popular items, goods of interest to customers and items that are usually purchased together, containing a large flow of customers and what order

items are bought by customers by exploiting the Received Signal Strength Information (RSSI), where the study calculated the speed of the elements and then the use of the automatic learning and the aggregate hierarchy to perform an in-depth analysis of the speed data. In this study, a preliminary model was implemented in which all components are constructed by ready-made devices. The results of the experiment showed that these methods have a low calculation and response time, which indicates that the proposed system is quite feasible in analyzing the practical shopping data.

The study of (Seshadri and Babu, 2018), Applying Data Mining Techniques for Store Layout of A Super Market, aimed at finding the most frequent products among the objects. This is based on building a sophisticated account that overrides the best examples of consecutive calculations that can be accessed on various supermarket information catalogs. The strategy can be used to reveal the importance of brilliant strategy and related elements. This has been achieved from exploration and then the best combination strategy is used to discover everything more. At this stage, the examiner can play the process of extracting information. Market testing is a vital part of the logical framework in retail stores to determine the order of products and to plan for the purchase of different products to enhance consumer loyalty.

## Methodology of the Study

The study relied on the descriptive analytical method for the completion of the study by using the following sources to collect the data, as follows:

*A) Primary data sources:* The study of data exploration in the supermarket system were studied to study the behavior of Jordanian consumers by designing a questionnaire containing a number of closed questions which were discussed through the following axes: the products sold in the consumer basket together, the best-selling products in a specific period, the consumer rush towards offers, consumer behavior towards product quality. Based on these axes, the study model was formulated as illustrated in Fig. 1.

*B) Secondary data sources:* They include books, studies, Arab and foreign sources, publications, regulations and instructions issued by the relevant academic, governmental and professional bodies in paper and electronic form.

### *Community and Sample of the Study*

The study community consists of all the supermarkets in Jordan which use the supermarket system, which I could not obtain from the Ministry of Industry and Trade in Jordan. A random sample of (97) supermarkets was selected to respond to questionnaires from Ramtha, Irbid City, Ajloun City, Amman.

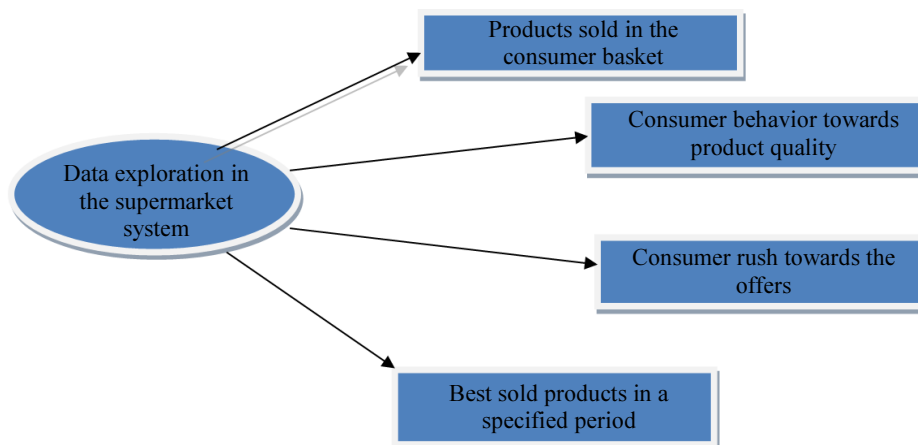


Fig. 1: Description of the study model

## Results and Discussion

This part includes Extract the correlation coefficients from the study variables, Verify the suitability of data for statistical analysis through one-sample Kolmogorov-Smirnov Test, description of the study sample using a relative Frequency and presentation of the results of the statistical analysis of the current study, which aims to identify the "Exploration of data in the supermarket system to study the behavior of consumers in Jordan" and the extent of reliance on the supermarket systems to study the behavior of consumers in Jordan and includes this section:

*First*, Spearman's (rho) correlation coefficients were extracted from the study variables. It is a coefficient that measures the extent of the relationship between two different variables (two or more variables) to determine whether the change in one or a group is related to the other. Table 1 shows that there is no high correlation among the variables and the data is ready for analysis.

*Second*, Verifying the data suitability for statistical analysis, for the purposes of verifying the objectivity of the results, one-sample Kolmogorov-Smirnov Test was carried out to verify that the study data was free from statistical problems that may negatively affect the results of the study.

In view of Table 2, the level of significance was ( $\alpha \leq 0.05$ ), which means that the distribution of all variables was normal, where the normal distribution ratios for all responses were greater than (0.05), which is the level adopted in the statistical treatment of this study.

*Third*, Description of the study sample, Table 3 shows the sample of the study using Frequency, it shows that the distribution of the study sample according to the type of the variable, where the highest percentage of the sample distribution according to the start of using the

supermarket system was (51.5%) for the answer (1-5 years) while the lowest percentage was (13.4%) for the answer (10-15 years), Fig. 2 shows that. The highest percentage of distribution of the sample study according to the age of the supermarket was (59.8%) for the answer (1-5 years) the lowest percentage was (10.3%) for the answer (5-10 years), Fig. 3 shows that. The highest percentage of the distribution of the sample according to the size of the supermarket was (45.4%) for the answer (medium), while the lowest percentage was (24.7%) for the answer (big), Fig. 4 shows that. The highest percentage of distribution of the sample study according to the demographic distribution was (51.8%) for the answer (Amman capital) the lowest percentage was (9.4%) for the answer (Ajloun City), Fig. 5 shows that.

*Fourthly*, to analyze the data, the five-dimensional Likert scale was used to answer the questions as shown in Table 4.

With regard to the limits adopted by this study when commenting on the arithmetic mean of the variables in the study model and deter exploration the degree of approval; The researchers has identified three levels (high, medium, low) based on the following equation (Abdullah and Nidal, 2011):

$$\text{Length} = (\text{the upper limit of the alternative} - \text{the minimum of the alternative}) / \text{the number of levels} = (5-1) / 3 = 4/3 = 1.33$$

Table 5 shows the scale in deter exploration the levels of relevance of the arithmetic mean to be used when commenting on arithmetical averages.

*Fifthly*, the arithmetical averages and the standard deviations of the responses of the study sample on the items of all fields aimed at identifying the extent of using data exploration in the supermarket system to study the behavior of the Jordanian consumers. One sample T-test was extracted and the results are presented below:

Table 6 shows that the statistical averages of the responses of the study sample on the items of the

products sold in the consumer basket ranged between (2.14-2.65). The results also show all the values of (T) of the extent of using data exploration in the supermarket system to study the Jordanian consumers behavior related to the disclosure of the products sold in the consumer basket. The field as a whole was negative and statistically significant at the ( $\alpha \leq 0.05$ ) level and the standard mark of the fifth ranking. This indicates a significant gap in the use of data exploration in the supermarket system to study Jordanian consumers behavior related to the disclosure of products sold in the consumer basket at once, this result is opposed with the study of (Jelly and Mohamed, 2017; Shelke *et al.*, 2017).

Table 7 shows that the statistical averages of the responses of the study sample on the items of the best sold products in a specified period ranged between (4.07-4.35). The results show that all T values for the extent of the use of data exploration in the supermarket system to study the behavior of the Jordanian consumers regarding the detection of the bestselling products in a specified period. The field as a whole was positive and statistically significant at the level of ( $\alpha \leq 0.05$ ) and the five-3 scale this indicates that there is no value gap using data exploration in the supermarket system to study Jordanian consumers behavior related to the disclosure of best-selling products within a specified period. This result was agreed with (Wang and Yue (2017).

**Table 1:** Spearman's (rho) correlation coefficients between study variables

Field	Correlation coefficient	Products sold in the consumer basket	Best sold products in a specified period	Consumer rush towards the offers	Consumer behavior towards product quality
Products sold in the consumer basket	Statistical significance				
	Correlation coefficient				
Best sold products in a specified period	Statistical significance	-0.06			
	Correlation coefficient	0.58			
Consumer rush towards the offers	Statistical significance	0.04	-0.19		
	Correlation coefficient	0.69	0.06		
Consumer behavior towards product quality	Statistical significance	0.05	-0.04	0.237	
	Correlation coefficient	0.61	0.71	0.02	

**Table 2:** Normal distribution of the study variables (One-Sample Kolmogorov- Smirnov Test)

Field	Kolmogorov-Smirnov (K-S)	Sig.*	Result
Products sold in the consumer basket	1.66	0.10	Follow the normal distribution
Best sold products in a specified period	2.38	0.06	Follow the normal distribution
Consumer rush towards the offers	1.73	0.11	Follow the normal distribution
Consumer behavior towards product quality	2.00	0.07	Follow the normal distribution

\*The distribution is normal when the level of significance ( $\alpha \leq 0.05$ )

**Table 3:** Description of study sample frequency

Study variables	Level	Frequency
The start of using the supermarket system	1-5 Years	50
	5- 10 Years	15
	10- 15 Years	13
	More than 15 years	19
	Total	97
The Age of the supermarket	1-5 Years	58
	5- 10 Years	10
	10- 20 Years	12
	More than 20 years	17
	Total	97
The Size of the supermarket	Big	24
	Medium	44
	Small	29
	Total	97

**Table 4:** Test the questionnaire

The scale	1	2	3	4	5
The level of agreement	Very low	Low	Immediate	High	Very high

**Table 5:** Scale of relevance for the arithmetic mean

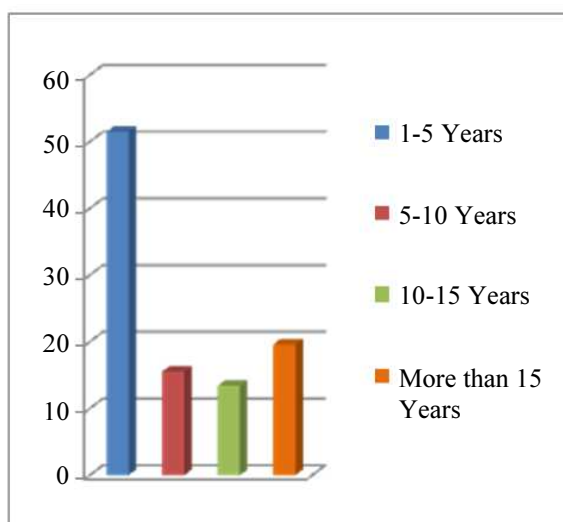
The scale of valuation	The arithmetic mean
Low	1-less than 2.33
Medium	2.33-less than 3.66
High	3.66-5

**Table 6:** The statistical averages and standard deviations of the responses of the study sample on the items of the "products sold in the consumer basket" and the results of the One Sample T-test

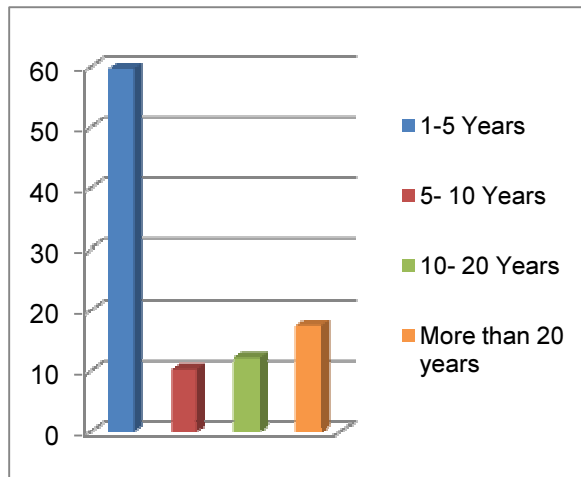
Items	The arithmetic mean	The standard deviation	The scale of valuation	T	The statistical significance
The system of the information helps me to analyze the basket of the consumers to know the essential products which are sold at once.	2.65	0.74	Medium	4.25	0.00
The system helps me know the products which are not sold in the same corner.	2.36	0.79	Medium	-7.94	0.00
Depending on the system, we offer the products related to the purchase in the same corner.	2.16	0.67	Low	-12.24	0.00
This system helps me know the relation of the purchase with the products which do not belong to the same family.	2.14	0.82	Low	-10.32	0.00
This system helps me know the relation of the purchase with the products which belong to the same family.	2.15	0.62	Low	-13.69	0.00
The field of "all the products which are sold in the basket of the consumer at once".	2.30	0.48	Low	14.282	0.00

**Table 7:** The statistical averages and standard deviations of the responses of the study sample on the items of the "best sold products in a specified period" and the results of the One Sample T-test.

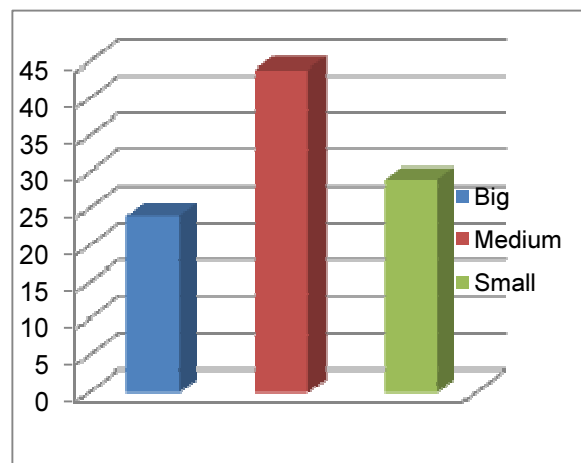
Items	Arithmetic mean	standard deviation	The scale of valuation	T	Statistical significance
I depend on the system by asking the provider according to historical sales.	4.35	0.91	High	14.563	0.00
I depend on the system to know the nature of the most best-selling in a limited period.	4.26	0.94	High	13.199	0.00
I depend daily on the system to know the percentage of sale.	4.19	1.09	High	10.684	0.00
This system helps me to predict the future sales for all the products.	4.07	1.16	High	9.127	0.00
The field of the " best sold products in a specified period".	4.22	0.77	High	15.550	0.00



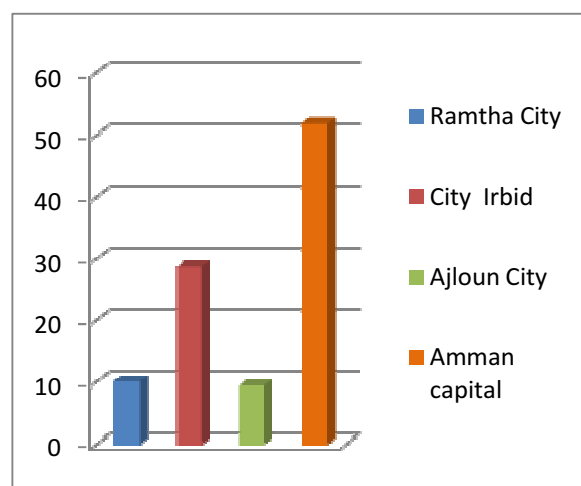
**Fig. 2:** The percentage of the sample study distribution according to the start of using the supermarket system



**Fig. 3:** The percentage of distribution of the sample study according to the age of the supermarket



**Fig. 4:** The percentage of the sample study distribution according to the size of the supermarket



**Fig. 5:** Distribution of sample of study by demographic distribution

Table 8 shows that the statistical averages of the responses of the study sample on the areas of the consumer rush to offers ranged between (3.59-3.88). The results also show that all the values (T) of the extent of using data exploration in the supermarket system to study consumer's behavior, indicating the absence of a value gap using data exploration in the supermarket system to study the behavior of the Jordanian consumers in relation to the disclosure of the consumer demand for the offers. The field as a whole was positive and statistically significant at the significance level ( $\alpha \leq 0.05$ ) and the standard mark of the pentagram (3). This indicates that there is no gap in value using data exploration in the supermarket system to study the behavior of the Jordanian consumers related to detecting the consumer rush towards the offers.

Table 9 shows that the statistical averages of the responses of the study sample on the areas of consumers behavior towards the product quality ranged between (3.19-3.79). The results also show that all the values of (T) Jordanian consumers related to the disclosure of consumer behavior towards product quality. The field as a whole was positive and statistically significant at the level of ( $\alpha \leq 0.05$ ). This indicates that there is no gap in value using data exploration in the super system to study the Jordanian consumers behavior related to the

disclosure of consumer behavior towards product quality, this study is consistent with the study of (Seshadri and Babu, 2018).

The researchers also applied the "One Sample T-test" on the tool as a whole. Therefore, understand the extent of using data exploration in the supermarket system to study the behavior of the Jordanian consumers as a whole. Table 10 shows that the value of (T) of the instrument as a whole was (10.13) positive and statistically significant at significance level ( $\alpha \leq 0.05$ ).

## Conclusion

The study aimed to identify the extent of using data exploration in the supermarket system to study the behavior of the Jordanian consumers as well as the extent of using data exploration in the shops across Jordan. Especially as shops tend to study consumers behavior as an activity that outperforms their competitors. To highlight the main problem of the study, the researchers discuss the extent to which supermarkets rely on data exploration to explore products sold in the consumer basket, identify best-selling products in a specific period, rush of the consumer towards offers and explore consumer behavior toward product quality.

**Table 8:** The statistical averages and the standard deviations of the responses of the sample of the study sample on the segments of the field "consumer rush towards the offers" and the results of the application of one sample T-test

Items	Arithmetic mean	Standard deviation	Scale of valuation	T	Statistical significance
I depend on the system to know about the products which will have discounts.	3.88	0.74	High	11.67	0.00
The system helps me to know the interest of the consumer in offers.	3.69	0.64	High	10.17	0.00
The percentage of the sales increase for the products which have discounts.	3.59	0.77	Medium	7.48	0.00
The field of "the rush of the consumer towards offers".	3.72	0.55	High	12.83	0.00

**Table 9:** The statistical averages and the standard deviations of the responses of the sample members on the areas of "consumer behavior towards product quality" and the results of the application of the "One Sample T-test"

Items	Arithmetic mean	Standard deviation	Scale of valuation	T	Statistical significance
The consumer interests in the products with less quality.	3.79	1.03	High	7.59	0.00
The system helps me know the attitude of the consumer towards the quality.	3.67	0.95	High	6.92	0.00
The consumer interests in the products with high quality.	3.19	0.71	Medium	2.57	0.01
The field of " the behavior of the consumer towards the quality of the product as a whole".	3.55	0.73	Medium	7.37	0.00

**Table 10:** (One Sample T-test) on the tool as a whole and therefore to identify the extent of using data mining in the supermarket system to study the behavior of the Jordanian consumer as a whole

Arithmetic mean	Standard deviation	Scale of valuation	Statistical significance
3.34	0.33	Medium	0.00



The results of the study indicate that data exploration is not used in the supermarket system to study the behavior of the Jordanian consumers regarding the disclosure of the products sold in the consumer basket. The results also showed that there is a use of data exploration in the supermarket system to study the behavior of Jordanian consumers regarding the disclosure of best-selling products in a specified period. The results showed that there is a use of data exploration in the supermarket system to study the behavior of the Jordanian consumers regarding the disclosure of the consumer rush towards offers, study the behavior of the Jordanian consumers regarding the exploration of consumer behavior towards product quality.

## Recommendation

The study also recommends further studies in the use of data exploration in the supermarket system to study consumer's behavior, especially since most shops use a system to handle sales movements, but there is not enough exploitation of database, which can help to study the behavior of the consumers.

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## Author's Contributions

All authors equally contributed in this work.

## Ethics

This study is original and contains unpublished material. The authors confirm that there is no conflict of interest involved.

## Constraints and Limitations of the Study

The main constraints and limitations facing the study are the lack of studies on data exploration in the supermarket systems in Jordan for comparison with this study. It was also difficult to know the study community from the Ministry of Commerce in Jordan.

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