Universiteit Leiden

ICT in Business

A Marketing Research on Exploring the Application Prospects of SaaS BI in Small and Medium-sized Retail Enterprises

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Date: 01/06/2018

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MASTER'S THESIS

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Acknowledgement

Studying in the ICT in Business program in the past two years is such an unforgettable experience for me and there are many people that I would like to thank for. First of all, I want to thank my first supervisor Niels van weeren, thank you for your close supervision, valuable feedback and sagacious guidance that helps me think from different angles that I never thought of, and thank you for always make some time and have the insightful discussions with me in your busy schedule. Secondly, I want to thank my second supervisor Mitra Baratchi, thank you for providing a sound and active review of my thesis and help me to adjust the format of the paper, as well as helps me build a foundation of the solution part.

I would also like to thank my sister Wei. W, thank you for inspiring me to research on this topic, which provides an initial entrepreneur idea for my future career. Thanks also go out to the four interviewees and respondents of my questionnaires, without your active response I can not conduct my research so smoothly.

Furthermore, I want to thank my parents for giving me the opportunity to follow the ICT in Business program of Leiden University and always give me support and encouragement behind me. Thanks for everyone that I get along with in the past two years. I will never forget the wonderful experience in the Netherlands.

Yifan Zhang
May 2018
Leiden

Abstract

With the rapid development of China's economy and the progress of technology, most large foreign capital and domestic retail enterprises have developed or purchased business intelligence systems to better analyze the data in order to occupy a more favorable position in the fierce market competition. However, the rest of small and medium-sized retail enterprises with even larger number of bases than big retail enterprises, due to the weak marketing sense or financial constraints, they rarely choose to implement the BI system in the actual operation and management. In this situation, if a kind of business intelligence system that can solve the considerations that cause delay in decision of small and medium sized retail enterprises can be published, it is not only a gospel for small and medium retail businesses but also a huge potential business opportunities.

This paper conducts a market survey on the BI application of small and medium retail enterprises in China and analyses the application of their marketing-mix theories and the satisfactory and dissatisfied functions during their using of BI system, which can help us to have a better understanding on the potential customer's pain point, so as to develop a business intelligence that can meet the needs of small and medium sized retail enterprises in China.

The first part explains the background, significance, research methods and structure of thesis writing. The second part expounds the theory of competitive advantage, the theory of business intelligence, SaaS and the current situation of research, which forms the logical framework of the thesis. The third part investigates the practical application of BI in China's small and medium retail enterprises and explores the factors that affect the implementation of BI in the actual operation. At the same time, it analyses the difficulties faced by small and medium retail enterprises in China and the future development trend. The fourth part proposes a solution to build a BI system for SaaS in China's small and medium retail enterprises which can meet the customers' needs that we derived from the market research. The research of this paper is the exploration of small and medium retail enterprises in business intelligence, trying to find out the direction of the development of business intelligence technology that suitable for small and medium retail enterprises in China.

List of Abbreviations

BI	Business Intelligence
SMRE	Small and Medium Retail Enterprises
BRE	Big Retail Enterprises
LCP	Life Cycle Period
AoE	Amount of Employee
ToR	Type of Retail
RiO	Role in Organization
PoP	Point of Parity
KPI	Key Performance Indicator
SaaS	Software as a Service
ETL	Extraction, Transformation, Loading
OLAP	On-Line Analytical Processing
ERP	Enterprise Resource Planning
CRM	Customer Relationship Management
SLR	Systematic Literature Review
SPSS	Statistical Package for the Social Sciences
USDC	US Department of Commerce
USSBA	United States Small Business Administration
IPSME	Interim Provisions on Small and Medium-sized Enterprises of China
NBSC	the National Bureau of Statistics of China
ADFS	Active Directory Federation Services

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I Introduction

1.1 Background

The global economy has been growing slowly since the global financial crisis in 2008. As a format which has relatively close contact with end users in the circulation domain, retail enterprises can be seen as a barometer which can reflect the change of economic situation on the first hand.

However, under the impact of information globalization, the explosion of information brings not only the progress of the society but also the rapid expansion of the amount of data. Compared to other industries, the data in the retail industry is even more huge and chaotic. How to improve the market performance of retail enterprises by taking advantages of data to establish a leading position in the complex business environment is always a common problem for all managers and entrepreneurs in the retail industry. In this situation, more and more retail enterprises are aware of the importance of managing and utilizing the big amount of data by using Business Intelligence(BI) technology. By taking the advantages of BI, retail enterprises can improve their core competence significantly by analyzing the market timely, exploring business opportunities and seizing opportunities according to the information that derived from the BI systems. Thereupon then, they can be involved a virtuous cycle of data->information derivation->core competence improvement->strategy implementation->data.

Nevertheless, it is not easy to develop and maintain such a big system for most retail enterprises, especially for medium and small sized retail enterprises. They are more likely to have a hesitation that if they should put a lot of funds into developing and maintaining a BI system and training employees when the potential benefits seem not that significant compared to the investment.

In this situation of market demand, developing a system which can provide a SaaS BI service to those retail enterprises who do not want to spend a lot of money on building their own BI system or purchasing a complicated BI system from outside suppliers is a big business opportunity. By doing so, a one-time investment can meet the need of most retail enterprises. Therefore, the objective of this paper is to have a deep research on what is the real implementing situation of BI system in different types of small and medium retail (SMRE for short) enterprises and analyze how to promote their organizational performance by taking the advantages of the SaaS BI system which will be talked in this paper.

1.2 Research Objectives

In this section, the research objectives of this paper are identified. Based on the actual management condition of BI in Chinese small and medium retail enterprises, combined with the current development of business intelligence technology, the objective of this paper can be seen in Table 1-1.

	Description
O1	Finding out what is the real implementing situation of BI systems in China ‘s SMRE
O2	Finding out how do China’s SMRE apply the marketing-mix strategies
O3	Analyzing what are the existing problems and developing trends of China’s SMRE
O4	Exploring the pros and cons regarding the functionality of BI system used in China’ SMRE
O5	Constructing an embryonic model of a SaaS BI system for China’s SMRE

Table 1-1 Research Objectives

1.3 Research Questions

To achieve the objectives of the research, 11 research questions are put forward in order to investigate the prospects of the SaaS BI system that we are planning to develop, which can be seen in Table 1-2.

Q1	How to define the scale of retail enterprises?
Q2	What is the value chain of retail enterprises?
Q3	How do the SMRE use their data?
Q4	Is there any relationship between the use of BI and the awareness of applying marketing-mix strategies in SMRE?
Q5	Is BI system already been widely used in SMRE?
Q6	What business intelligence system does SMRE usually use?
Q7	For those SMRE that implemented BI system already, what functions are the most satisfactory or unsatisfactory to them?
Q8	For those SMRE that do not use BI system, why?
Q9	What is the core competence and competitive advantages of SMRE?
Q10	What are the development trends and challenges for small and medium retail business?
Q11	How to build a business intelligence system that can meet most small and medium retail enterprises’ need?

Table 1-2 Research Questions

1.4 Hypothesis

This research focuses on the marketing level and the implementing level of applying BI rather than a narrow viewpoint that centers on a specific domain or application on BI (e.g., Hadoop, MapReduce, etc.,) in SMRE. Thus, the hypotheses that we defined for this research are given in Table 1-3.

	Hypothesis	Classification
H1	At present, the popularity of BI in SMRE is lower than that in BRE	
H2	The consciousness of the necessity of marketing means in SMRE is weaker than that of BRE	
H3	The situation of applying marketing-mix strategies in SMRE is weaker than that of BRE	
H4	The BI implementing rate of SMRE startups is lower than that of SMRE in other LCP.	
H5	The SMRE that using BI are those who pay attention to marketing-mix stratgies and promotion activities	

H6	There is significant difference between different types of retail on BI usage.	Implementation Level
H7	SAP is the most frequently using BI system among the SMRE	
H8	For SMRE that have not yet implemented BI, most of them have the plan to launch BI within 3 years.	
H9	For SMRE that implemented BI, the most satisfying BI function is the “Interactive Visualization”	
H10	For SMRE that implemented BI, the most unsatisfying BI function is the “Mobile Version”	
H11	The core competence of SMRE is the low price	
H12	The trend of SMRE is centralization and e-commerce	Marketing Level
H13	BI can help SMRE applying their marketing-mix strategies and promotion means significantly in the operation.	
H14	The SMRE do not have the consciousness of establishing brand image and enterprise culture	

Table 1-3 Hypothesis

1.5 Structure Outline

This paper is problem oriented, which follows the mentality of discovering problems, analyzing problems and solving problems. The structure outline of this paper can be seen in Table 1-4.

Discover problems	Introduction	● Background ● Research objectives ● Research questions ● Methodologies ● Research structure
Analyze problems	A review of related theories	● Retail business ● Core competence ● Business Intelligence ● SaaS
	BI in small and medium retail business analysis	● BI implementation situation ● Marketing-mix strategies applying situation
	Small and medium retail enterprises analysis	● Value chain ● Developing trend ● Challenges & problems
Solve problems	System requirement and model structural analysis	● User’s requirement ● SaaS BI System architecture
	Model design	● The design of ETL ● The design of data warehouse and OLAP ● The design of multi-client compatibility ● The design of modules

Conclusion	● Prospects

Table 1-4 Structure Outline

II Related Theories

In this section, the basic theories related to our research, including the core competitiveness theory, the components and concepts of BI, the definition and advantages of SaaS are introduced, which provided the theoretical foundation for this research. In addition, the research status of each theory is also briefly introduced.

2.1 Core Competences

Core competences is also called “Core Competitive Ability” or “Competitive Advantages”, which refers to the collection of the abilities that can help the enterprises to deal with the business transformation and competition from outside competitors.

According to Michael Porter’s “Competitive Advantage” model, enterprises usually take actions so that they can defend their market position and gain potential return on investment based on their competitive advantages. Porter's Five Forces Framework is a famous tool for analyzing competition of a business. In Porter’s model, there are five elements that can influence the industry competition, which is: Bargaining Power of Suppliers, Threat of New Entrants, Threat of substitutes, Bargaining Power of Buyers and Industry Rivalry. By analyzing the five aspects mentioned above, enterprises can estimate the intensity of competition and potential benefits of the industry comprehensively. Below is a graphical representation of Porter's five forces.

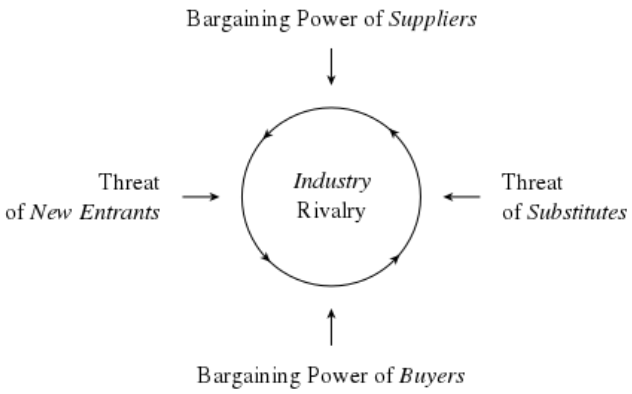


Figure 2-1 Five Forces Framework of Michal Porter

2.1.1 Definition of Core Competence

Core competence is the core and key factor in competitiveness, which is composed of resources and energy. Therefore, for the research of the core competence of SMRE, more and more attention is paid to the analysis of the company's resources and capabilities.

From the pointview of English scholar C.K Prahalad and G. Hamal, first of all, the core competences should be able to help enterprises enter different markets, and it should

become the foundation when the enterprises determine to enlarge their business scale. Secondly, core competences can contribute significantly on their products and customers. The contribution is determined as the most concerned, central, and essential benefits in the market competition, instead of the normal and short-period advantages. Last but not the least, the core competence of an enterprise should be hard to be copied and imitated, which is the technology or ability that makes a company unique and matchless.

Therefore, the identification of the core competence of an enterprise can begin with the resources and capabilities of the enterprise, from which we can find out the competitive power within the enterprise, and then determine which advantages can constitute the core competence.

Specifically, it can be divided into the three steps as follows:

1) **Resource and capability analysis**. Determine the indicators of the enterprise core competence analysis, measure the performance of “Front Office” and “Back Office” resources and technical capability of the enterprise.
2) **Competence analysis**. Compare the performance of the enterprise with other enterprises in the same industry to find out the superior resources and abilities of the other enterprises, and then define the collection of the competences of the enterprise.
3) **Core competence analysis**. For the collection of competence factors, test each of them whether it conforms to the characteristics of the core competitiveness, that is, whether it conforms to the development and competitive strategy of the enterprise, which can be divided into the aspects as follows:
    a) Whether the competence matches the goal and the future plan of the enterprise?
    b) Whether the competence is able to improve the management efficiency and have significant contribution to the market performance of the enterprise?
    c) Whether the competence is unique and hard to be copied or imitated?
    d) Whether the competence is difficult to be substituted by the competitors?
    e) Whether the competence is possible to provide the potential to enter a new market and develop a range of products and services to meet the market's needs, thus helping to expand the scope of the business?

After considering about the metrics mentioned above, the factors that do not conform to the characteristics can be eliminated, and the final set of resources and capabilities are the core competitiveness of the enterprise.
Besides, core competence also need to be protected and managed in a complex and frequent-changing business environment to enhance the sustainable competitive advantage of the enterprise industry.

For the retail industry, the experts have been trying to find out the true essence of the core competence for retail enterprises. Dawson and Coe pointed out that the competitive power of retail enterprises mainly includes the new retail enterprise the price structure, advanced information management workflow, new marketing tools, product exhibition pattern, and investment capabilities etc. Similarly, in Dupuis and Prime’s perspective, core competence of retail enterprises can be divided into the two aspects as follows,

1) **Front Office**: It is the ability of the retail marketing segment that can be observed directly by consumers.
2) **Back Office**: It mainly refers to the ability of the retail enterprise in the aspects of commodity purchasing management, organization structure and operation management etc, which are the activities that can support the front office marketing.

In the modern society, the competition of retail enterprises is becoming more and more complex, which requires the retail enterprises to transfer the ability of back-office and front-office effectively.

2.1.2 Competitive Advantages of Retail Enterprises

Specifically, the competitive advantage of retail enterprises mainly comes from the following factors: Product, service, locations, shopping experience, low cost operation and information system applications. Normally, these factors are not independent but connected with each other closely. For example, the relationship of service with low cost operation and the information system applications are not only supporting each other but also constraint with each other. The competitive advantages may come from one of the factors, and it may also come from the general aspects of the factors. In most situation, retail enterprises will definitely not be using a single way to build their competitive advantages, but to build a high wall by using various ways to prevent the entrance of competitors so that they can ensure their market position.

2.2 Business Intelligence

The essence of business intelligence is the process of converting data into information. It is the process of extracting useful data from massive data. After extraction, transformation, and loading, the set of data can be integrated into the data warehouse to get a global view. After that, the set of data will be analyzed and processed by OLAP, data mining and many other techniques to help the enterprises make decisions by taking advantage of the data that after processed. After years of technological development, the architecture of business intelligence is basically can be shown shown in figure 2-2 below. The main technology consists of three parts: Data Warehouse, Online Analytical Processing and Data Mining.

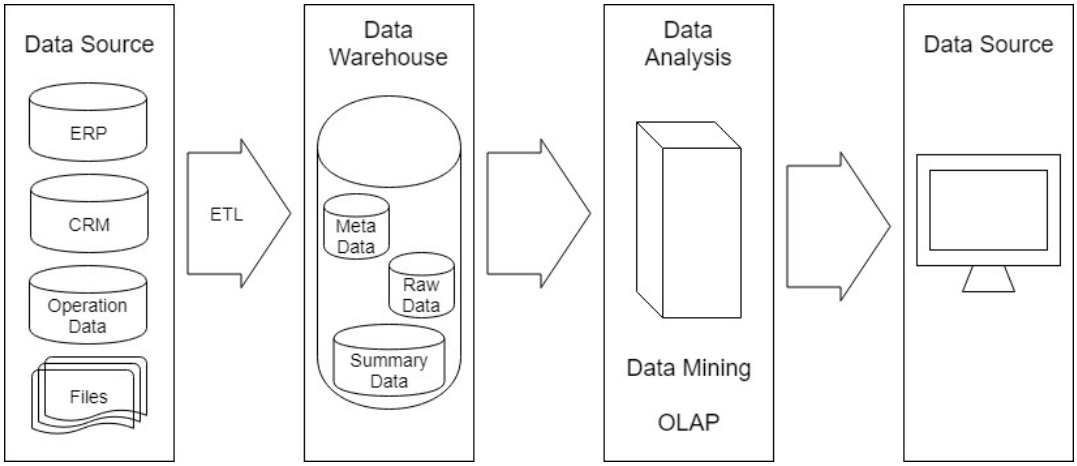


Figure 2-2 Business Intelligence Architecture

2.2.1 Data Warehouse

The data warehouse is firstly put forward by William H. Inmon in his book "Building the Data Warehouse," and thus widely accepted. It is defined as “a set of data that is subject-oriented, integrated, non-volatile and time variant which can help for the decision-making process”. It stores up-to-date and historical data in one single place that are used for creating analytical reports for operators
throughout the enterprise.

1.The concept of Data Warehouse

From the definition of Data Warehouse, we can see that it contains the four aspects as below.

1) **Subject Oriented**: It is an abstract concept that corresponds to the object-oriented of traditional database. It synthesizes, classifies and analyzes the data in enterprise information system at a higher level. Each theme corresponds to a macro analysis area. A data warehouse excludes data that is useless for decision making and provides conciseness for specific topics.
2) **Integrated**: The data in data warehouse are processed, summarized and collated by the system on the basis of extracting and cleaning the original scattered database. Inconsistency in the source data must be eliminated to ensure that the information in a data warehouse is the consistent and overall information of the entire enterprise.
3) **Time Variant**: Data in a data warehouse usually contains historical information, and the system records information from a certain point in the past (such as when the data warehouse is started to be applied) to the current stage. Through these information, we can make quantitative analysis and forecast on the development progresses and future trends of the enterprise.
4) **Non-Volatile**: Because the data in the data warehouse is mainly used for decision analysis, once a data is entered into the data warehouse, it will normally be retained for a long time, which means there are a lot of query operations in the data warehouse, but the modification and deletion operations are quite few, usually only need loading and refresh in a fixed period.

2.Extraction, transformation and loading (ETL)

ETL (Extraction, Transformation and Loading) is a key procedure of the realization of data warehouse. It is a process that can integrate and filter the raw data into a data warehouse according to certain logical rules, which generally includes the three steps as follows:

1) **Extraction**: Reading data from a variety of raw data sources, including databases, documents, etc., which can be seen as a prerequisite for further work
2) **Transformation**: According to certain logical rules, the heterogeneous data that come from different data source can be extracted and converted into to a unified format.
3) **Loading**: It is the process of importing the converted data into the data warehouse

Generally speaking, traditional systems are complex data systems that are composed by many incompatible data sources and databases, which cannot communicate with each other

directly. And such a system is also created by a lot of manpower and material resources and is not easy to be replaced. Especially in data, due to the fact that the interface between data is integrated, therefore, once a module changes, it is likely that the whole system will be changed. The purpose of business intelligence system is to assist users to make decision through data analysis. However, different sources of data, different formats and different reliability lead to the difficulty and complexity of the system implementation and data integration.

At this point, if there is a comprehensive solution to the unity of numbers, the integration tool will make the work much easier, and this tool is ETL.

3. System components of Data Warehouse

A large enterprise may have a lot of data, such as tabulate data like Excel, Access. It may also have database like SQL Server or Oracle database. It is unfeasible for end users to access those data by using linked table directly since the amount of data is too large (Figure 2-3). In this situation, Inmon proposed a theory that building a so-called middle-layer to integrate all the data together and come into being a big database can solve this problem perfectly. Based on Inmon's theory, we split the large database into multiple, small data-marts according to the different business needs (Figure 2-4). The coarse arrow in the figure is the process of data importing, in which the data is not simply copied, but to do the operation of filtering out the illegal, irregular and error data in the middle of the large database to ensure the integrity, consistency and regularity of the data as much as possible in the ETL process. By doing so, users can query valid data in these small databases in an efficient way.

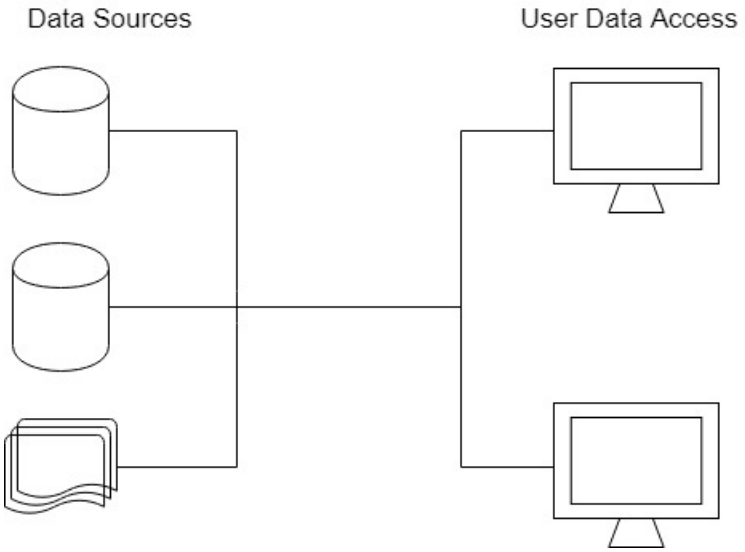


Figure 2-3 Direct Link

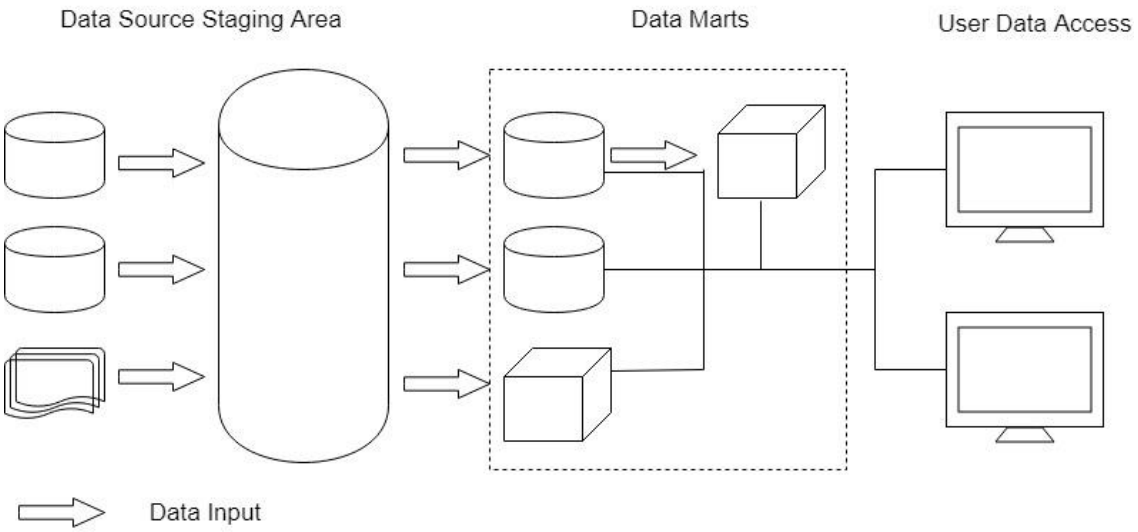


Figure 2-4 Design of ETL

2.2.2 OLAP

OLAP (Online Analytical Processing) is an approach to answer the Multi-Dimensional analytical (MDA) queries swiftly in computing proposed by E.F. Codd in 1993, the father of relational database. Typical applications of OLAP include business reporting for sales, marketing, management reporting, business process management (BPM), budgeting and forecasting, financial reporting and similar areas, with new applications coming up, such as agriculture. The term OLAP is created as a slight modification of the traditional database term online transaction processing (OLTP).

1.The Attribute of Dimension

A **dimension** is a structure that categorizes facts and measures in order to enable users to answer business questions. Commonly used dimensions are people, products, place and time (Oracle Data Warehousing Guide, 2014). Below is the three typical attributes of the dimension.

1) **Hierarchy**: The dimension is hierarchical in relation to the granularity of the data. For example, in time dimension, "day" can be used as the unit scale, also "week", "month", "quarter", "year" is possible. Similarly, take geographical dimension as an example, we can use "Region", "Country", "State", further subdivide to "City" or even "Street" and so on. Normally, the more detailed the analysis of the data, the more complex the hierarchy in the same dimension. Vice versa, the rougher analysis on data, the simpler the hierarchy will be.
2) **Classification**: Besides the layer of dimension, it is necessary to define the classification. A class is a classification of all values of a dimension according to a certain dividing standard. For example, for retail business, commodities can be divided into import goods and domestic goods, and clothing can be divided into casual clothing, formal clothing, sportswear, pajamas and other different types, etc. The difference between dimension hierarchy and classification is that the dimension level is mainly for the ability to drill down and aggregate data up to meet the

customer's requirement of analyzing data at different levels. The classification of dimension is to be able to compare among different categories, such as the ratio of the sales of imported goods to domestic goods, the proportion of clothes sold in different stores, etc. Normally, in a system, classification and hierarchy are always coexisted so that users can analyze data from different angles.

3) **Multi-dimensional Cube**: If we annotate each point of data in the range of values in each dimension, we will get the multi-dimensional cube. For example, If the dimensions of the cube are the time dimension, the product dimension, the geographic dimension, the supplier dimension, the retailer dimension, we can then analyze the sales data of a particular item that a retailer sells to a supplier in a given area for a certain period of time. Similarly, more multi-dimensional cube can be created by doing so, which can help to build a comprehensive analysis of the retail sales performance for retail enterprises.

2. The operations of OLAP

The multi-dimensional analysis of OLAP is mainly the operation on data in slicing, cutting, aggregating, rotating, drilling and so on, so that customers can extract data in multidimensional, multi-side and multi-angle, and then to find out the underlying data patterns. Common operations include slice and dice, drill down, roll up, and pivot.

1) **Slice**: It is the act of picking a rectangular subset of a cube by choosing a single value for one of its dimensions, creating a new cube with one fewer dimension
2) **Dice**: The dice operation produces a subcube by allowing the analyst to pick specific values of multiple dimensions. The picture shows a dicing operation: The new cube shows the sales figures of a limited number of product categories; the time and region dimensions cover the same range as before.
3) **Drill Down/Up** allows the user to navigate among levels of data ranging from the most summarized (up) to the most detailed (down). The picture shows a drill-down operation: The analyst moves from the summary category "Outdoor-Schutzausrüstung" to see the sales figures for the individual products.
4) **Roll-up**: A roll-up involves summarizing the data along a dimension. The summarization rule might be computing totals along a hierarchy or applying a set of formulas such as "profit = sales - expenses".
5) **Pivoting**: Pivot allows an analyst to rotate the cube in space to see its various faces. For example, cities could be arranged vertically and products horizontally while viewing data for a particular quarter. Pivoting could replace products with time periods to see data across time for a single product.

2.2.3 Data Mining

Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating (Han, Kamber, Pei, Jiawei, Micheline, Jian, 2011).

1. The concept of Data Mining and classification

The classification of data mining is diversified. According to the different mining objects, it can be divided into Anomaly detection, Association rule learning, Clustering, Classification, Regression, Summarization and so on. According to the different mining methods, it can be divided into database method, statistical method and so on. Retail industry is the main application field of data mining technology. According to the characteristics of retail industry, the amount of data is huge and growing day by day, and the amount of data accumulated by large retail enterprises is even larger. The abundant data are the basis of data mining, such as customer consumption record, inventory record, normal sales and promotion record, sales and service information of e-commerce platform, etc.

2. Techniques:

The techniques of data mining refer to the algorithms or approaches that integrated in the mining process. The examples of techniques that are most commonly used in data mining can be seen as follows:

1) **Decision tree**: It is Is a flowchart-like tree structure that can be used both to analyze data and to predict. It consists of nodes, branches and leaves. Starting from the root node, different branches are divided according to different conditions, thus different leaves are obtained. It classifies speed blocks and is suitable for large-scale data processing.
2) **K-Nearest Neighbor**: It is a method that classify each record in the data set. It can be also used in prediction, which is to return the prediction value of the data sample in designated position. Due to the fact that the objects that are directly adjacent to each other have similar predictive values, we can use this feature to predict and find the position of an objective when we know the prediction value.
3) **Statistical analysis**: use the correlation principle of statistics to analyze the data, use conventional statistics, correlation analysis, regression analysis, difference analysis, etc.
4) **Apriori Algorithm**: Apriori is an algorithm for frequent item set mining and association rule learning over transactional databases. It proceeds by identifying the frequent individual items in the database and extending them to larger and larger item sets as long as those item sets appear sufficiently often in the database.
5) **Genetic Algorithm**: Genetic algorithm is a metaheuristic inspired by the process of natural selection that belongs to the larger class of evolutionary algorithms (EA). Genetic algorithms are commonly used to generate high-quality solutions to optimization and search problems by relying on bio-inspired operators such as mutation, crossover and selection.

2.2.4 Important concepts related to systems

In this section, the important concepts that are used in the design of SaaS BI system are introcuded.

1.Hub and Spoke

One of the most important concepts in the SaaS BI model is hub and spoke. They correspond to a two-dimensional cube and a multi-dimensional cube respectively. Hub is like a central control center that centrally manages all the information connected to the Spoke on

this Hub (Does not include Spoke's specific factual sales figures, etc.), including Calendar, Supplier, Retailer, Cube Metrics, etc. When initializing the data in Spoke, we can get specific data in each Spoke by acquiring different configuration parameter values. Each Spoke can only be connected to one Hub, of course, by changing the configuration parameter, it is possible to connect it to another Hub. Generally speaking, the data that we want to display in the report form comes from the multi-dimensional cubes from Spoke. The sketch of the relationship between Spoke and Hub can be seen as follows:

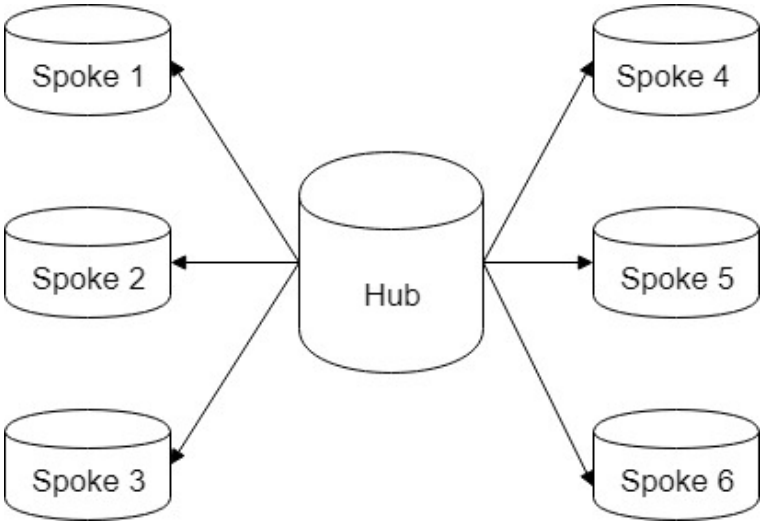


Figure 2-5 Hub and Spoke Architecture

2.Stage Cube and Live Cube

Stage cube and Live cub are two servers for the multi-dimensional cube. Normally, a Spoke 2D database and temporary cube will be installed on the stage server. After importing the cube from the 2D database of spoke's factual data, we will copy the temporary Cube to Live Server, which will serve as a database for customers to actually use. Due to the fact that it is quite expensive to use server resources when data is imported and processed in Cube if the Live Cube is provided directly to the customer, which will lead that the system will be extremely poor in performance. To solve this problem, adding a temporary server as a buffer will greatly improve performance.

2.3. SaaS

SaaS (Software as a service) is a software licensing and delivery model in which software is licensed on a subscription basis and is centrally hosted. (Ziff Davis, 2014) It is sometimes referred to as "on-demand software" ("IT Channel Glossary”, 2013), and is formerly referred to as "software plus services" by Microsoft ("Microsoft describes software plus services", 2007). SaaS is typically accessed by users using a thin client via a web browser. SaaS has become a common delivery model for many business applications, including office software, messaging software, payroll processing software, DBMS software, management software, CAD software, development software, gamification, virtualization, accounting, collaboration, customer relationship management (CRM), Management Information Systems (MIS), enterprise resource planning (ERP), invoicing, human resource management (HRM), talent acquisition, learning management systems, content management (CM), and service desk

management. SaaS has been incorporated into the strategy of nearly all leading enterprise software companies (McHall, Tom, 2011).

2.3.1 The Definition of SaaS

SaaS is the abbreviation of Software as a Service, which is also called the online software based on Web. It is a relatively low-cost and low-risky type of software which can provide various application service and solutions based on web.
Normally, SaaS service providers will first unify the application on its server, and the clients can customize the functions on their own according to the needs of the enterprise business. The clients of SaaS neither need to spend money on developing and maintaining the software they need, nor purchasing access of software from outside suppliers. They can use the SaaS software immediately as long as they have a computer with browser. The core concept of SaaS is the service of software. It subverts the inherent business model of traditional software, which mostly treats software as a tangible commodity. On the opposite, SaaS is software as a service, but not a commodity.

2.3.2 The comparison between SaaS and traditonal software

Compare to the traditional software, SaaS has its own exceptional advantages. Below we can see the comparison between SaaS and Traditional Software.

	SaaS	Traditional Software
Payment methods	Periodical payment	One-time payment
Using methods	Any place with access to the Internet	The device with installed software
Service methods	Service Provider offers services and maintenance	Need to train professional IT maintenance team
Hardware Configuration	Simple terminal	Complex IT facilities
Updating	The service provider is responsible for updating the software version	Need customers to update themselves

Table 2-1 The comparison between SaaS and traditional software

In general, the advantages of SaaS can be seen as follows:

1) **Conveniency**: Traditional software usually needs to be installed or deployed on its own computer or server. In comparison, the only requirement of SaaS software requires is a web browser installed on the computer.
2) **Low Cost**: Traditional software operation and maintenance need to have its own IT personnels. On the contrary, all maintenance matters of SaaS are completed by service providers. Users only need to pay a small amount of maintenance costs, which can reduce the costs distinctly.
3) **Flexibility**: Purchasing a traditional software means the enterprise have the access to use it, however, if the actual performance can not reach customers' need, it is impossible to say "I don't want it anymore" and get the money back. But SaaS is more flexible and the form of charge is also diverse. It can charge by the number of times, or according to the number of users or time of use. From this perspective, it can be regarded as a kind of software that can be used on demand which can bring significant flexibility during their using.

Every coin has two sides, there are also some disadvantages of SaaS that can be seen as follows.

1) **Data Security**: When it comes to SaaS, the most important problem is data security. On the one hand, because enterprises put all kinds of data on the server side of the service provider, it is inevitable that there are various security problems, such as data disclosure and data distorting. On the other hand, data is transmitted through the Internet, there is a problem of data transmission security.
2) **Need Internet**: SaaS is an online software, and nothing can be done without the Internet. The stability of the Internet is a key.

2.4. Research Status

This section introduces previous scholars' research in the field of core competitiveness, business intelligence and SaaS, which provides the basis authoritative academic background for this research.

2.4.1 Core Competences

In terms of the research status of competitive advantage, Joseph Chamberlain is the first scholar who put forward the concept of “Competitive Advantage” in his book “The Theory of Monopolistic Competition”. In 1978, Hofer and Schendel introduced the concept into the field of strategic management. The concept of "Capability" is first mentioned in enterprise strategy theory by Philip Selznick in 1957 and he put forward the concept of "ability" or "special ability" in his book"The Leadership in Administration". After that, this concept has been further studied by the famous strategy management experts Igor Ansoff and K. Andress, which has had a great influence in theory and management practice. The most practical and convincible analysis of competitive advantage is initiated by Michael Porter. In his book “Competitive Advantages”, Porter definies the Five Forces Framework to analyze the competition of a business in 1979. It draws from industrial organization economics to derive five forces that determine the competitive intensity and, therefore, the attractiveness (or lack of it) of an industry in terms of its profitability.

In sum, the theory of competitive strategy can be divided into three periods:

1) Since 1960s, focus on the strategic management
2) Since 1980s, focus on the research of market structure
3) Since 1990s, focus on the quality of enterprises and the research on core competence, which has gradually become the newest enterprise theory and the important enterprise management theory.

2.4.2 Business Intelligence

Howard Dresner proposed the concept of Business Intelligence in 1989. Not come singly but in pairs, in the book Business@ The Speed of Thought Using a Digital Nervous System that published in 1999 by Bill Gates, it mentioned that in raising a company's intelligence, the chief executive's role is to create an atmosphere that promotes information sharing and collaboration, giving priority to those areas in which information sharing is valuable.

Additionally, providing digital tools to make information sharing possible and reward those who contribute to an adequate flow of information. We can say that in this book by Bill Gates, there is a wealth of business intelligence in it.

Through reading various documents, this dissertation selects three large - scale transnational business intelligence suppliers: SAP, Oracle and Teradata based on the scale, market closing and development momentum, combining the relevant white papers and industry analysis reports, business intelligence solutions they provide, and summarizes the basic viewpoints and characteristics of the BI systems.

1) SAP's research perspective on business intelligence: SAP's business intelligence strategy emphasizes collaboration, and the goal is to make business intelligence tools work effectively in the upper, middle and lower reaches of the enterprise. On the other hand, operational business intelligence is an important technology standard of SAP for a long time. Using Business Intelligence to obtain data of ERP system and supply chain system is an important Strategy for SAP to consolidate its market position of ERP and expand their new market significantly. SAP Business Objects is directed to decision makers, analysts and business-oriented employees, and SAP is widely used in operational department, which is a complement for each other and they almost cover each process of business intelligence.
2) Oracle's research perspective on business intelligence: Oracle’s points of view regarding business intelligence is that only through the correct presentation, the business leaders can gain intuitive insight. Based on this recognition, Oracle integrated and developed Siebel, Hyperion and Brio which are the former business intelligence companies. The advantage of Oracle is that it has a relatively reasonable assort of portfolios of its products. It not only provides independent BI product but also embedded BI systems within applications. Its business intelligence system which based on the former foundation of Siebel acquires a lot of positive assessment from clients. Besides, Oracle has a flexible and open framework, which is a key reason of many vendors use Oracle Fusion to integrate their business intelligence product.
3) Teradata's research perspective on business intelligence: Teradata’s perspective is that business intelligence technology must have the breadth, depth, and speed to truly realize its value. Breadth refers to that the more business data we have, the more overall picture of the business we will get. Depth refers to that the user of the business intelligence system covers the users from the management to operational employees, which will form an entire-personnel intelligence. Last but not the least, speed refers to that users could obtain the information or report form they need quickly by using the so-called” dynamic business intelligence”. Based on these recognition, Teradata mainly integrates and develops the massive parallel processing data platform and dynamic business intelligence architecture.

Regarding the research on BI, from 1990 to 1995, the research on BI is mainly based on database, modeling. Edward r. Tufte has laid the foundation for the study of information, especially the quantitative visualization of information, which is published between 1990 and 1991. Inmon introduced the concept of data warehousing in 1994, and one of his book “Managing the Data Warehouse” which published in 1996, became a pillar of the Data Warehouse. And” the Corporate Information Factory” which was published in 1997, established the frame of the famous Information factory for Data Warehouse and Data

mining. After 1998, the study of business intelligence was increasing gradually. Larry Kahaner put forward competitive intelligence, and some scholars study data warehouse and data mining technology, data quality, machine learning and other aspects. Since 2001, the research topic of business intelligence had risen from the technical level to the corporate strategic level, such as balanced scorecard and strategic competition analysis.

2.4.3 SaaS

SaaS is a software application mode based on Internet which began to rise and develop at the beginning of this century. In just a few years, the development of SaaS has been relatively mature, and its application fields are more and more extensive, which can provide more and more comprehensive functions to meet more customers' needs. At present, about 1/4 independent software vendors in the United States have started to enter the SaaS field(Software Ranking Report, 2018), and this number is expected to increase significantly in the next few years. However, many enterprises still have concerns about the security of SaaS, which is an urgent problem for SaaS service providers.

The SaaS model is mainly used to provide scenting relationship management and human resources, but now it has been applied to business intelligence field. As early as 2008, Acxiom Company of the United States had already launched the business intelligence system of SaaS mode. In the propaganda and promotion, it mentioned the features of its low cost and ease of use. By early 2010, SAP, the leading management software giant, released SAP BusinessObjects BI OnDemand, which is a business intelligence solution for a limited number of SaaS models on the market. The rapid deployment, ease of use, and strong functionality are the major features of the software and it has been already widely used in numerous enterprises in different industries. When using the SAP Business Objects BI on Demand, customers can log in to OnDemand.com and by simply registering, they can get support for business intelligence services on the Internet. In addition, the solution is very humanized, and it can select the business module according to the needs of the actual enterprise, so as to achieve the best cost and efficiency. In the current SaaS business intelligence industry, there is no doubt that SAP is the most mature solution. Although some other major business intelligence providers in the traditional business intelligence and some start-up companies (such as PivotLink and Birst) is trying to test the water involved in this field, but in the number of technical depth and customers, they are not in a competitive level with SAP.

III. Research Methodology

Throughout this chapter, the quantitative and qualitative research methods that used on this research are described. In the preparation stage, an initial literature review is conducted and several hypotheses are proposed based on the findings from the paper and the actual situation of retail enterprises. In the research stage, we used SLR, questionnaires and semi-structured interview respectively to answer the research questions that we defined in Chapter 1. After collecting data, we use the SPSS tool to analyze the data that we put in order from the questionnaire and use the coding approach to extract effective information

from the semi-structured interviews. What is more, a secondary research which is to validate and testify the conclusion that we summarized from the primary research is conducted. Throughout all the process mentioned above, all the hypothesis we identified in Chapter I are tested and convinctive and evidentable conclusion are made correspondingly.

3.1 Research Formulation

Figure 3-1 is the formulation of the research process during the study of delving the implementing situation of BI system in SMRE.

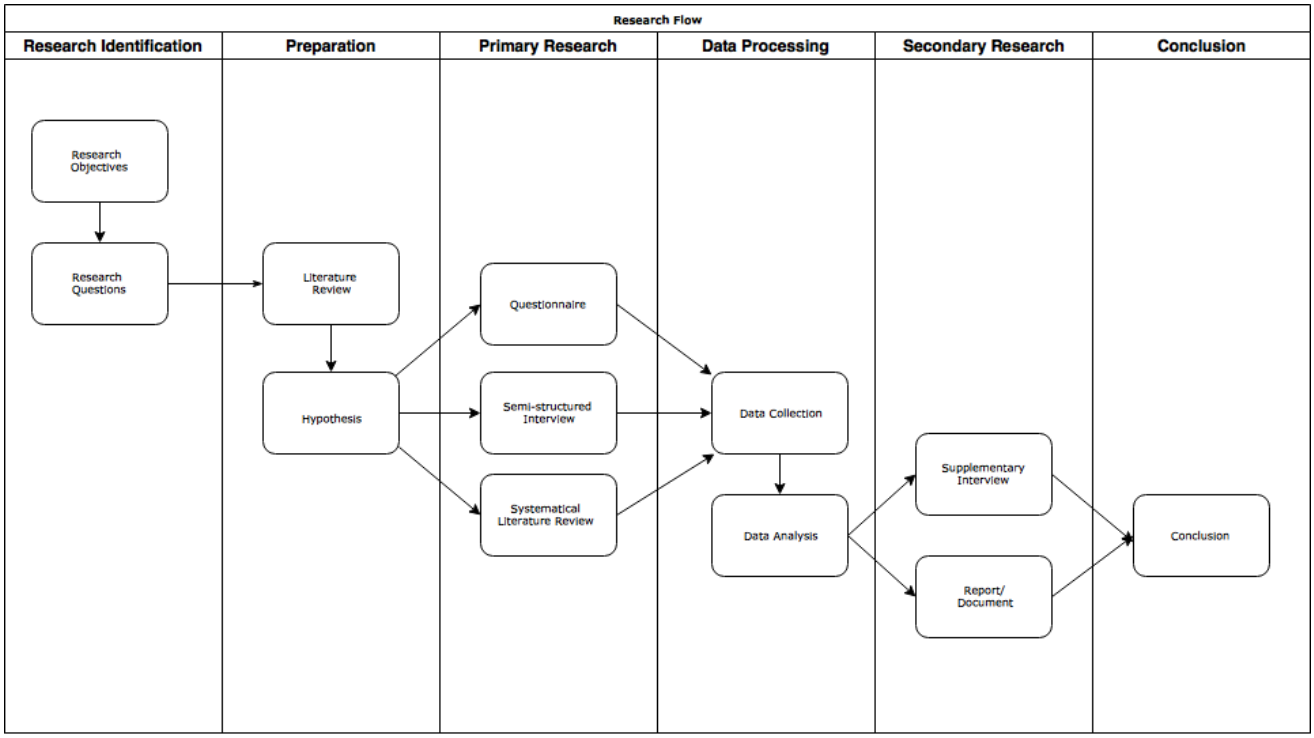


Figure 3-1 Research formulation

The first step of the research is identifying the research objectives and raising the research questions accordingly. After setting the general direction and specific research questions of the research, a primary literature review which can provide a basic understanding and basic knowledge regarding the target field and help to evaluate the research objectives and questions that set in the previous step is needed.

Also, several hypotheses are proposed after the literature review and some adjustment concerning the research questions could be carried through according to the findings. The third step is the primary research stage, which is the core content of this paper. The procedures of the distributing questionnaires to the practitioners in retail industry and organizing semi-structured interviews with the retail handlers in different business scale and class are taken for answering the research questions in both quantitative and qualitative research approach. Also, a systematic literature review of the authoritative publication and papers related in the BI within the retail domain will be carried out. The fourth stage, which is also the stage of presenting the fundamental research achievement will be put on the table. In this stage, the data of the feedback of questionnaires and interview coding will be collected and analyzed comprehensively. As a replenishment, a secondary research will be conducted in order to testify and validate the research findings and revise the research conclusion properly based on the resemblance and discrepancy that derived from the

supplementary interview and financial reports and documents issued by the government financial institution and official association in retail industry.

3.2 Systemtic Literature Review

In order to answer the questions with regard to the big picture of retail industry, a systematic literature review is conducted. The core tool of the evidence-based prototype is the SLR, which is a systematic methodology of defining answerable research questions, searching the literature for the best available evidence, appraising the quality of the evidence, collecting and aggregating available data for answering the identified questions. Three phases are needed within the SLR process, which is planning, conducting and reporting. The whole process of SLR is presented in Figure 3-2.

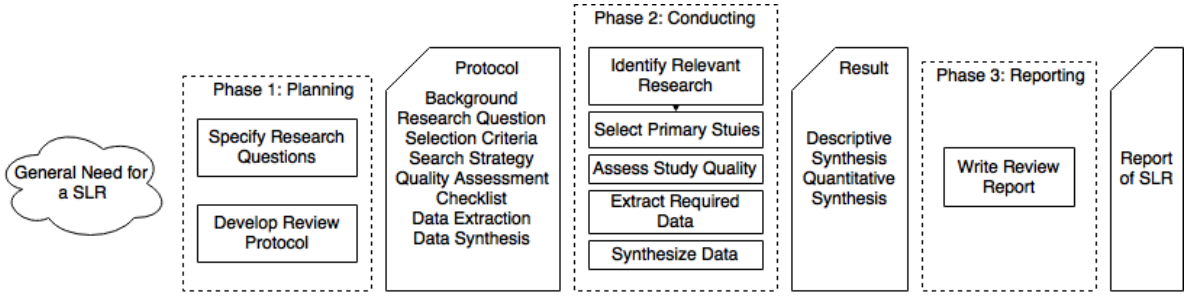


Figure 3-2 Systematic Literature Review

The objective of the search process is to identify relevant studies based on the search strategies we defined. The process of defining search strategies includes defining search sources and defining search strings. Searching sources consist of some search engines as made available through the digital libraries e.g. ACM，IEEE，and Springer. Searching engines are chosen for conducting automated searches, which means the researcher can use these online databases to thoroughly retrieve the relevant studies with the search strings that adapted to the given search syntax and rules.

This section is applied to answer the research questions as following,

Q1. How to define the scale of retail enterprises?

Q2. What is the value chain of retail enterprises?

3.2.1 Defining Selection Criteria

To have an accurate and valuable searching, several selection criteria are defined, which can be shown in Table 3-1.

Inclusion Criteria
C1: Subordinated to the domain of retail industry
C2: Focus on the small and medium retail enterprises
C3: Related to concrete business intelligence solutions and evaluation
Exclusion Criteria
C4: In the form of books or digital publication
C5: In the form of editorial, abstract, keynote, poster

Table 3-1 Inclusion and exclusion criteria

Inclusion criteria and exclusion criteria are defined for selecting relevant studies. Retrieved papers are firstly checked with exclusion criteria. If one paper cannot meet any one of the exclusion criteria, C4 OR C5, it will be excluded. The remaining papers are checked with inclusion criteria. If one paper meets all the inclusion criteria, i.e. C1 AND C2 AND C3 AND C4, then it will be included.

3.2.2 Search Strings

Table 3-2 shows the search strings that we input in the search bar. To be more targeted, the terms of searching are divided into SMRE terms and Business Intelligence terms.

Item	SMRE terms	Item	Business Intelligence Terms
B1	Retail industry	C1	Business Intelligence
B2	Small and medium retail	C2	Business Analytic
B3	Marketing mix strategies	C3	OLAP
B4	Core Competence	C4	SaaS
B5	Retail sales	C5	Data mining

Table 3-2 Search strings keywords

The use of the search strings can be combined with Boolean operator as: (B1 OR B2 OR B3 OR B4 OR B5) AND (C1 OR C2 OR C3 OR C4 OR C5)

3.2.3 Selection Process

The following steps are derived from the guidelines for performing SLRs in and applied as a procedure in systematically searching and selecting the relevant studies:

1. Define research objective and hypotheses .
2. Conduct several examples and review the scopes.
3. Revise research hypotheses, define the search string and identify inclusion and exclusion criteria.
4. Conduct the initial search.
5. Review the title, abstract, and keywords of the initially retrieved studies.
6. Revise inclusion and exclusion criteria and select potentially relevant studies.
7. Remove the duplicate studies.
8. Review the potentially relevant studies selected
9. Review the entire content of initially selected studies and identify the similar studies.
10. Review relevant studies selected.
11. Identify the final set of relevant studies.

In selecting the relevant studies in steps 6,9, and 11 of the search and selection procedure described above, we applied the inclusion criteria to propose, apply, validate, classify or thoroughly analyze.

Steps 8 to 11 are carried out independently and the similar paper will be removed. After each step. Independent analysis results will be documented in spreadsheets, which will be used to compared and merged by one of the authors. Conflicts will also be noted for discussion, which will be held before the joint authors continued with the subsequent step.

Digital Library	Search Result (Step 4)	Initially Selected (Step 7)
ACM	521	8
EBSCO	250	1
Google Scholar	60	1
IEEE	582	11
Science Direct	150	2
Springer	22	4
Total	1585	27

Table 3-3 The result of initially selected papers

Table 3-3 shows the initial number of studies retrieved in step 4. After step 5, we selected 70 studies out of these for further research. The process is to revise inclusion and exclusion criteria while working on these studies. At the end of step 6, candidate papers came up with 46 studies. In step 7, duplicate studies within this set and identified 4 studies are removed. In steps 8 and 9 we went over these studies in detail, discussed and resolved conflicts, and identified 33 studies for a deeper review. In the end, the steps 10 and 11 is for the inclusion of several studies and finally identify the final 27 studies.

We analyzed the identified articles and iteratively developed a categorization scheme for structuring them, and developed a research framework, in which each article is grouped into one or more concepts. We took the work in as our basis for the initial version of the scheme, which is then gradually refined with the new or modified concepts during the categorization process. With each modification of the scheme, the articles that had been categorized with the outdated version of the scheme are rescanned and categorized according to the new version. Four iterations are performed before all the articles are classified accordingly.
Eventually, the resulting plot has been divided into two main sub-components as presented in Table 3-4. The main focuses are Research content, and the Main research focuses. The subcategories under ‘main research focus’ are: adaption, application, architecture, development, meta-Analysis, validation and the subcategories under ’Main Research Focus’ are: Adaption, Application, Architecture, Development, Meta- Analysis, and Validation. This research is based on the assumptions that each article should have at most one primary research.

Research Content	Main Research Focus
Case Study	Adaption
Comparison	Application
Description	Architecture
Empirical Study	Development
Framework	Meta-Analysis

Mapping/Literature Review	Validation
Theoretical	

Table 3-4 Study Focusing Frameworks

Topic	Explanation
Case Study	Articles in which process or record of research in the development of a particular person, group, or situation over a period
Comparison	Articles in which consideration or estimate of the similarities or dissimilarities between two things or more
Description	Articles in which described for presentation purpose or applicable methods
Empirical Study	Articles in which an empirical study (qualitative, quantitative) for develop, apply, validate.
Framework	Articles in which study on systems of rules, ideas that are supporting structure of BI
Mapping/Literature Review	Articles in which review or survey the current knowledge including substantive findings, as theoretical and methodological contributions to a particular topic, and do not report new or original experimental work.
Theoretical	Articles in whose consideration of a study is based on assuming or hypothesis

Table 3-5 Research content and explanation

In addition to the concepts for the research content, it is interesting to signify the main research focus of these articles. The conceptual framework for model research distinguishes 6 categories of concepts, which are adapted to characterize the main research focus of an article.

Topic	Explanation
Adaption	Articles that make or modify suitable new purpose
Application	Articles that have the main focus of applying technologies, tools
Architecture	Articles that have the main focus on the architecture or model structure
Development	Articles in which release or describe about new technologies, tools, practices, etc.
Meta-Analysis	Articles in which the emphasis is on surveying or comparing existing maturity models.
Validation	Articles in which a model is applied for the purpose of validating new technologies, tools, or practices.

Table 3-6 Topic and Explanation

3.3 Questionnaire

In order to deeply study the application of marketing strategy and the situation of BI application in medium and small retail enterprises and make the dissertation more persuasive and convincible, this dissertation investigated the sample of small and medium-sized retail enterprises in China by using the empirical method of questionnaire (Appendix A).

3.3.1 Questionnaire Design

The respondents of the questionnaires are the employees in clothing, food & beverage, daily supermarket and many other types of retail enterprises. Considering the level of understanding of marketing theory and BI techniques among the respondents, the questionnaire design is more concise and the questions are more detailed and specific. Figure 3-3 shows the outline of the questionnaire design, which contains 4 general parts:

①The basic information;

②Marketing consciousness;

③Marketing-mix applying situation;

④The application investigation of BI users and non-users

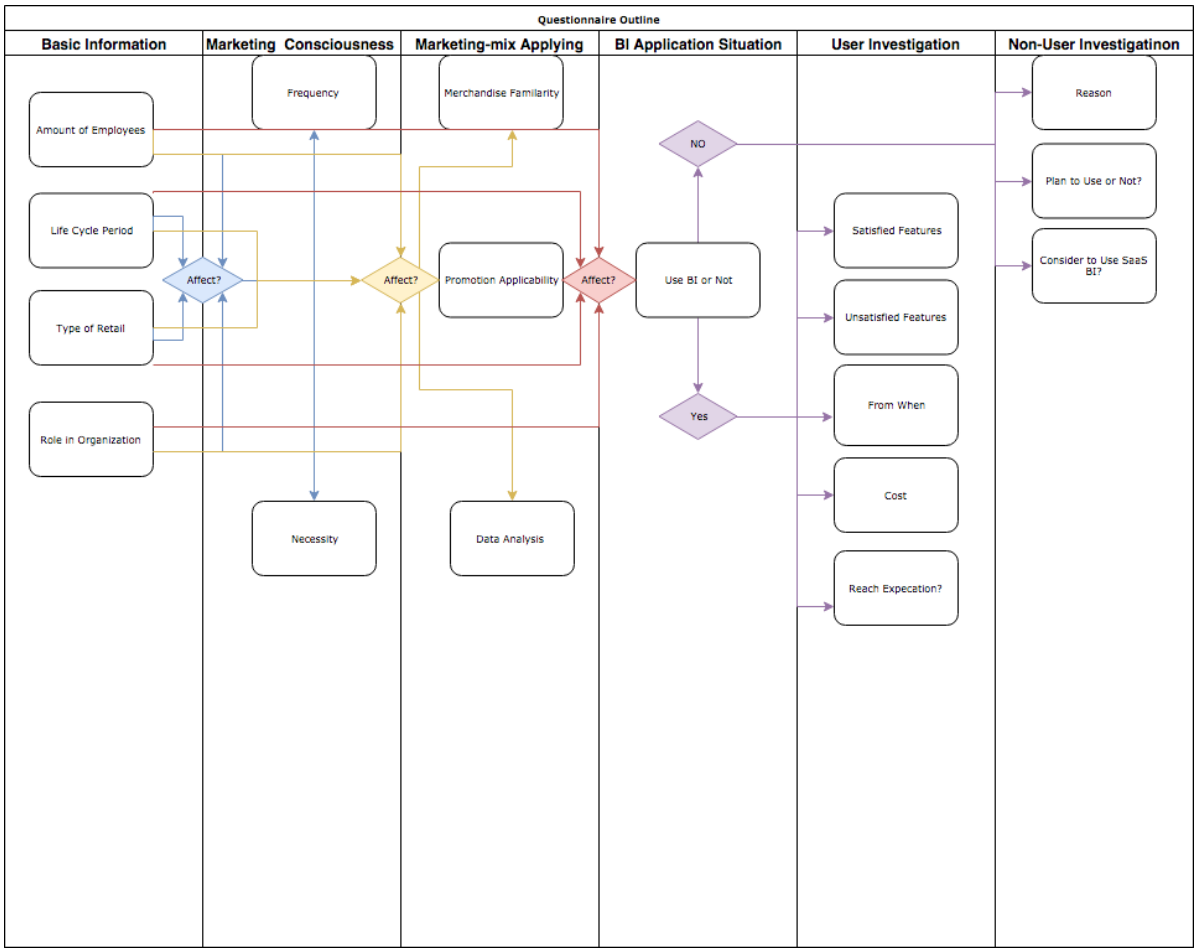


Figure 3-3 Questionnaire outline

This research used questionnaire to investigate the BI implementing situation of small and medium retail enterprises in China. Various statistical analysis methods are used to extract

key factors. The data are processed separately from "the application of marketing theory in SMRE in China" and " the implementing situation of BI of SMRE in China". By means of item analysis T test, factor analysis and other statistical analysis methods, the data of the former two parts of the scale items are analyzed, the hypotheses of the research are verified, and the reliability and validity of the questionnaire are tested. This paper provides the basis for the following study on the application strategy of the BI implementation to the small and medium retail enterprises in China.

This section is applied to answer the research questions as following,
Q3. How do the SMRE use their data?
Q4. Is there any relationship between the use of BI and the awareness of applying marketing-mix strategies in SMRE?
Q5. Is BI system already been widely used in SMRE?
Q6. What business intelligence system does SMRE usually use?
Q7. For those SMRE that implemented BI system already, what functions are the most satisfactory or unsatisfactory to them?
Q8. For those SMRE that do not use BI system, why?

3.1.2 Data acquisition and statistical analysis methods description

In order to understand the current situation of the use of marketing theory and BI in small and medium retail enterprises, from December 2017 to February 2018, a questionnaire survey is conducted on small and medium retail enterprises in China. 80 questionnaires are distributed for small and medium retail enterprises, and 61 questionnaires are take back, 44 of which are valid. Through the statistical analysis of these questionnaires and the interviews with small and medium-sized retail enterprises, we acquired the first-hand information about the use of retail marketing strategies and BI techniques in small and medium retail enterprises.

This research collects the questionnaire data, the effective organization, the summary and the display mainly through the table, chart, graph and so on. At the same time, we use the method of general statistical analysis to further study the information contained in the questionnaire data.

3.1.3 Tool & approach selection

After having received all responses data analysis is conducted by using IBM SPSS 22.0 and numerous statistical techniques such as reliability analysis, validity analysis, descriptive statistic analysis, independent sample T test and one-way ANOVA. The anonymized survey results are listed in Appendix B.

Reliability analysis is to test whether the evaluation items are complete and comprehensive, and the overall structure is reasonable after the incident. The validity of a project refers to the rationality and necessity of updating the evaluation project at the right time. (John Wiley & Sons, 2002) An effective scale should evaluate that the evaluation results before and after the item update have a high correlation, otherwise, if the difference is large, it means that the evaluation items may not be a measure of the same characteristics. The evaluation project may not be able to achieve its intended purpose.

Validity analysis is the process of gathering evidence to provide “a sound scientific basis” (Messick, S, 1995) for interpreting the scores as proposed by the test developer and/or the test user. Validation therefore begins with a framework that defines the scope and aspects (in the case of multi-dimensional scales) of the proposed interpretation. (American Educational Research Association, 1999) The framework also includes a rational justification linking the interpretation to the test in question.

One-way ANOVA, also known as F test, is a statistical inference method to infer whether the total mean represented by two or more sample averages is different from that of two or more samples through the analysis of data variation. The ANOVA produces an F-statistic, the ratio of the variance calculated among the means to the variance within the samples. If the group means are drawn from populations with the same mean values, the variance between the group means should be lower than the variance of the samples, following the central limit theorem. A higher ratio therefore implies that the samples are drawn from populations with different mean values. (Howell, David, 2002).

The Independent Samples T Test compares the means of two independent groups in order to determine whether there is statistical evidence that the associated population means are significantly different. The Independent Samples t Test is a parametric test. The t-test can be used to determine if two sets of data are significantly different from each other.

The Descriptive Statistical Analysis is a summary statistic that quantitatively describes or summarizes features of a collection of information, (Mann, Prem S, 1995) while descriptive statistics in the mass noun sense is the process of using and analyzing those statistics. Descriptive statistics is distinguished from inferential statistics (or inductive statistics), in that descriptive statistics aims to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent. Use of logarithms makes graphs more symmetrical and look more similar to the normal distribution, making them easier to interpret intuitively (Nick, Todd G, 2007). Measures of central tendency include the mean, median and mode, while measures of variability include the standard deviation (or variance), the minimum and maximum values of the variables, kurtosis and skewness.

3.4 Semi-Structured Interview

Table 3-7 presents the overall information of the respondents that we interviewed. In the first research stage, the two respondents are the practitioners that devoting themselves into retail industry and know well about the industry actuality both “Front Office “and “Back Office”, which can help us to derive comprehensive acquaintance regarding the marketing-mix strategies consciousness in their daily activities and the actual using status of BI system in their operations as well. To testify the results we conclude, a complementary interviewee is also conducted. Due to privacy reasons and ethical considerations, the names of the company are anonymized and the interviewees cases are described with the letters A, B, C and D. All of the participants are mature professionals in the retail domain of China which ensures to obtain best results and provide reliable and valuable coding basis for further analysis. Both of the interview A and B lasted for 30-50 minutes and are conducted by one interviewer and transcripts of the interviews are made.

Interviewee	Years of Experience	Roles	Types of Retail	Scale of Business
A	9	Sales manager of Northeast of Mainland China	Clothing	Relative Medium
B	17	Owner/Top Manager	Supermarket	Relative Small
C	7	Mid-lane Manager	Clothing	Relative Small
D	3	General Employee	Food&Beverage	Relative Medium

Table 3-7 Characteristics of Interviewees

This section is applied to answer the research questions as following,

Q9. What is the core competence and competitive advantages of SMRE?

Q10. What are the development trends and challenges for small and medium retail business?

Q11. How to build a business intelligence system that can meet most small and medium retail enterprises' need?

3.4.1 Interview Design

To have a comprehensive acquaintance regarding the marketing-mix strategies consciousness in the daily activities and the actual using status of BI system in the operations in SMRE, a semi-structured interview is conducted and according to the theme of each part, several sub-questions are proposed and may have slightly adjustment based on the responses from interviewees. The theme outline of the interview can be seen in Table 3-8.

Stage	Theme	Target
S1	Interviewee's background	Identify the background and the obligation of the interviewee.
S2	Strategic positioning and core competence	Identify the mission, vision, objectives, goals and the core competences in the market
S3	SWOT and development strategy	Identify the SWOT of the business and the development strategies
S4	Marketing-mix strategies consciousness	Identify the approach and frequencies of using marketing-mix strategies in activities
S5	BI implementing and using	Identify the service condition of BI within the organization
S6	The coalescent of BI and marketing strategy	Identify the effect of BI that brings into the retail operation
S7	Evaluation of use of BI	Identify the satisfactory and unsatisfactory functions

Table 3-8 Interview outline

3.4.2 Coding

To apply the grounded theory, the method of Corbin and Strauss is used. Grounded theory seeks not only to uncover relevant conditions but also to determine how the actors under investigation actively respond to those conditions, and to the consequences of their actions (Strauss & Corbin, 1990). The data found in the interviews are analyzed to find potential indicators of phenomena, which are then given potential conceptual labels. Different phenomena with the same conceptual term accumulate as the basic units for theory. These concepts in the grounded theory approach become more numerous and more abstract as the analysis continues (Straus & Corbin, 1990). What is important for grounded theory is to group concepts that are found to refer to the same phenomenon into categories. Corbin and Strauss call these categories the “cornerstones” of a developing theory because they provide the means by which a theory is integrated. For example, the sentence “When it comes to “waking up” the car the challenge is that secure communication and booting of ECUs can result in a considerable amount of time. How to tackle that?” could be code as #challenge_ECU_secure_and_booting.

The coding of the text is conducted in several stages:

Stage	Description
S1	Coding and labeling the text format.
S2	Refining labels.
S3	Developing concepts from the labels.
S4	Finding relationships between concepts
S5	Visualizing concept integration.

Table 3-9 Stages of coding

After coding, several scopes of code will establish, which can help us to pick the key information that we need.

IV. Result

This chapter demonstrates the results after conducting the methodologies that we described in Chapter III. This chapter is consisted of SLR findings, questionnaire findings, semi-structured interview findings, secondary research and the result summary at the end of this chapter. Throughout this chapter, research questions from 1 to 11 can be answered.

4.1 SLR Findings

Based upon the findings from the SLR after the collection of the necessary and relevant research articles, we are able to acquire the theoretical definitions and information that corresponds to the topic.
Research question 1 and 2 will be answered in this section.

4.1.1 Time Distribution

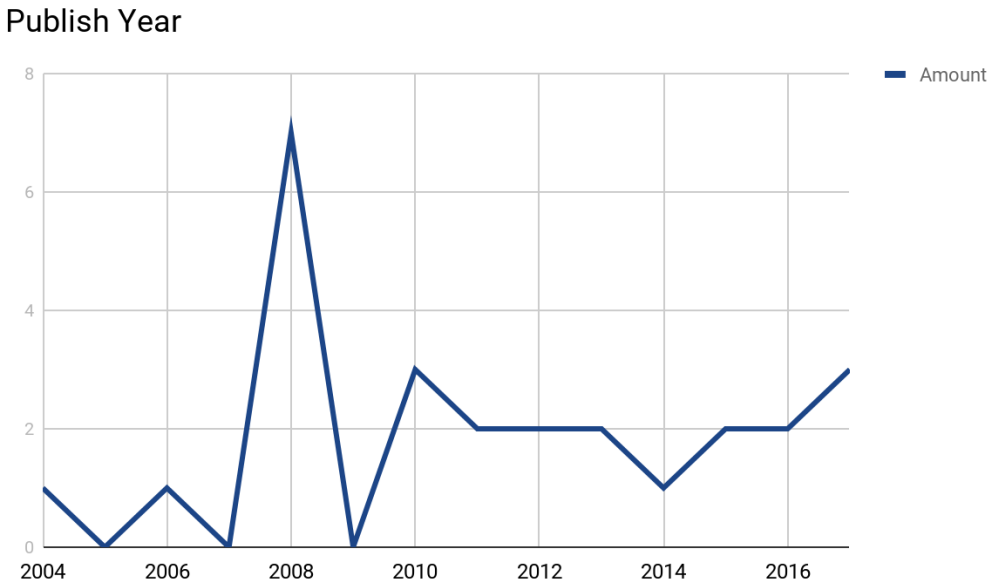


Figure 4-1 Time distribution of the selected paper

Figure 4-1 shows the time distribution of the selected papers from the year 2004-2016. The year 2008 shows the highest number of 7 studies and the distribution over years presents a stable tendency since 2010.

4.1.2 Research Content

According to the purpose and property of the papers, 8 categories of papers are classified: Framework, Case Study, Theoretical, Comparison, Release, Empirical Study, Description and Literature Review, which can be shown in the following chart and table.

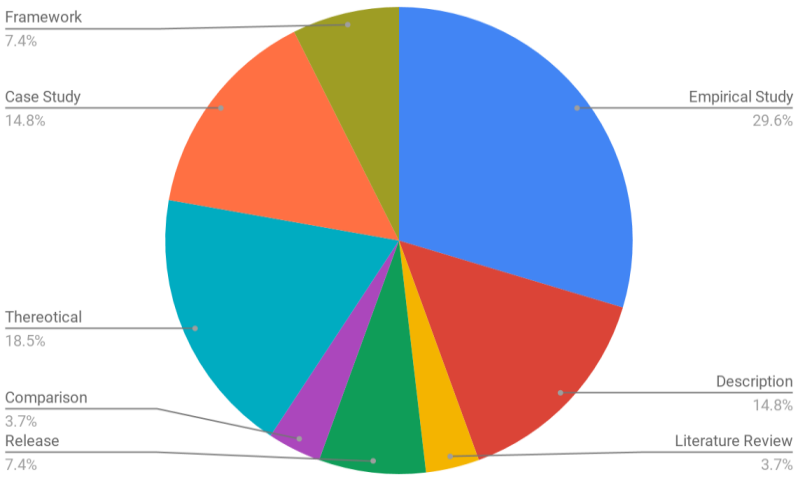


Figure 4-2 The classification of research content of the selected papers

Research Content	Amount of Study	Percentage
Empirical Study	8	29.6%
Description	4	14.8%
Literature Review	1	3.7%
Release	2	7.4%

Comparison	1	3.7%
Theoretical	5	18.5%
Case Study	4	14.8%
Framework	2	7.4%

Table 4-1 The classification of research content

Figure 4-2 and Table 4-1 showed that most of the selected papers are “Empirical study” studies (8 papers/29.6%). The 2nd is Theoretical with 5 studies, followed by Description and Case study (4 studies/14.8%).

4.1.3 Research Focus

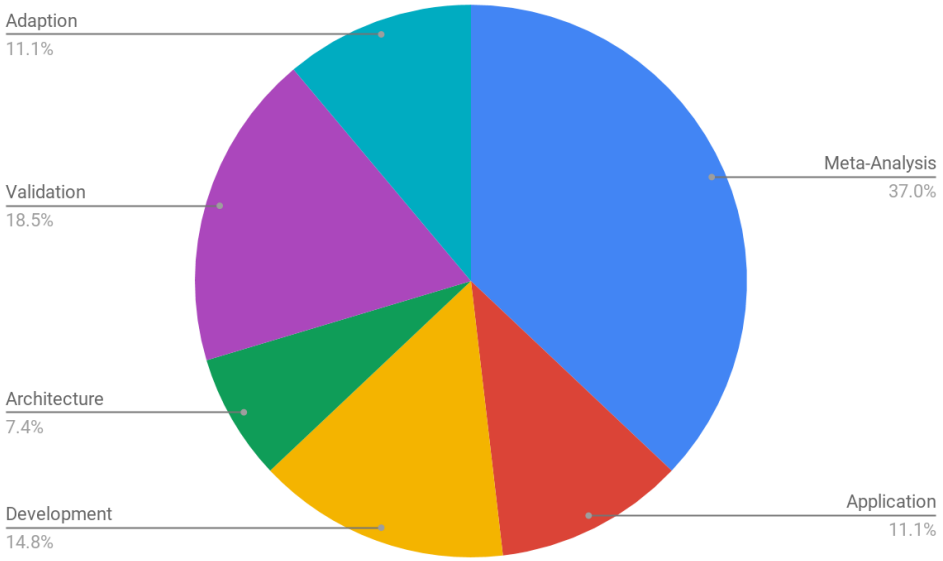


Figure 4-3 the classification of Main Research Focus

Main Research Focus	Amount of Study	Percentage
Meta-Analysis	10	37.0%
Application	3	11.1%
Development	4	14.8%
Architecture	2	7.4%
Validation	5	18.5%
Adaption	3	11.1%

Table 4-2 the classification of Main Research Focus

4.1.4 Result Description

After reading through the selected papers, research question 1 and research question 2 can be answered as follows,

1. The identification of small and medium retail enterprises

Retail refers to the activity of reselling. Some retailers may sell to business customers, and such sales are termed non-retail activity. In some jurisdictions or regions, legal definitions of retail specify that at least 80 percent of sales activity must be to end-users. (Pride, W.M., Ferrell, O.C. Lukas, B.A., Schembri, 2018) At present, the mainstream definition of retail enterprises can be divided into two classifications:

From a marketing perspective, according to the references of marketing in the recent 30 years, the most common identification of retail enterprise is that retail enterprise is the individual or company that is engaged in the marketing activity which connect the producers and consumers in a certain way (Jones, Brian D. G.; Shaw, Eric H, 2006). More specifically, they purchase merchandise from manufacturers, middlemen or wholesalers, and then sale the goods to the consumers directly on their own.

It is not unique, but has its counterpart, according to the definition of retail enterprise that made by USDC, retail trade includes all entities that sell smaller quantities of goods to the general public (US Department of Commerce, 2007). They do not change the form of goods, and the resulting services are only limited to the sale process of goods. Retail enterprises mainly provide goods and services to end consumers (individuals, groups). The core essence is a kind of circulation service and value service.

As for the definition of the scale of retail enterprises, there is no definitive explanation in the world, but many countries have relatively fixed and specific standard for the retail enterprises division. If we look at the limitation of the amount of employee, as stipulated by USSBA, the enterprises whose number of employees is fewer than 500 can be defined as small enterprise (United States Small Business Administration, 2011). Similarly, the basic Law on small and Medium-Sized Enterprises in Japan, enterprises whose capital is whose amount of employee is less than 50 in retail industry, and whose amount of employee is less than 100 at the same time in the wholesale industry are classified as small enterprises (Research Office, Small and Medium Enterprise Agency, 2016). In China, according to the "Interim provisions on small and Medium-sized Enterprises of China", the standard for the classification of small and medium enterprises Retail SMEs are required to meet the following requirements: less than 500 employees. Among them, the medium enterprises must meet the standard of the number of employees is 100 or more, the rest are small enterprises (Promotion Law of China, 2003).

In this paper, the small and medium enterprises with this stipulation IPSME will be taken as the research criteria of defining SMRE.

2. The value chain retail industry

Since the essence of retail business is to take circulation as a value enhancement service, a correct understanding of its retail value chain will help us to better grasp and understand its business model.

It is an ability that can deal with supply chain, cash flow and data flow and help to create an organic and interrelated link that integrate the session of production, finance, marketing, human resources and other value aspects within the organization and furtherance an excellent job in the aspects of planning, supervision, coordination and control. By doing so, an invisible “chain” that adapt and connect the production, supplying, and sale session into the same string is created (Michael Porter, 1985). This is so-called “Value Chain”.

Horizontally, each activity in the value chain has its own operating costs and assets. If the cumulative total cost benefit of all activities in the enterprise value chain is less than that of a competitor, there is a cost advantage. From a vertical point of view, it is to break down the

value activities of the whole industry into a series of related strategic activities. From the retail enterprise as a whole, all the costs can be divided into each value activity, and the value created by each value activity as well as the degree of satisfaction with the customer can also be revealed. More importantly, the cost of retail enterprises is resulted by various factors. (Gurra, 2012) Generally, these factors covered the aspects like economy of scale, control and coordination of internal links (procurement, logistics, sales), application of advanced technology, promotion of customer value, construction and implementation of internal system, etc. The basic value chain of a retail enterprise is similar, that is, supplier management-procurement-distribution-sales-service. Below is the core value chain model of retail enterprises. The main activities are those that play a leading role in the basic activities of the enterprise, such as the purchase of goods, production management, logistics management, marketing and customer service, and a series of business operations. (Xiaobo Wu; Zengyuan Wu, 2006)

Like it shows in Figure 4-4, support activities refer to those inputs and infrastructure that play a complementary role in the basic activities of the enterprise, including general management, legal document processing, finance and so on, to maintain the whole value chain.

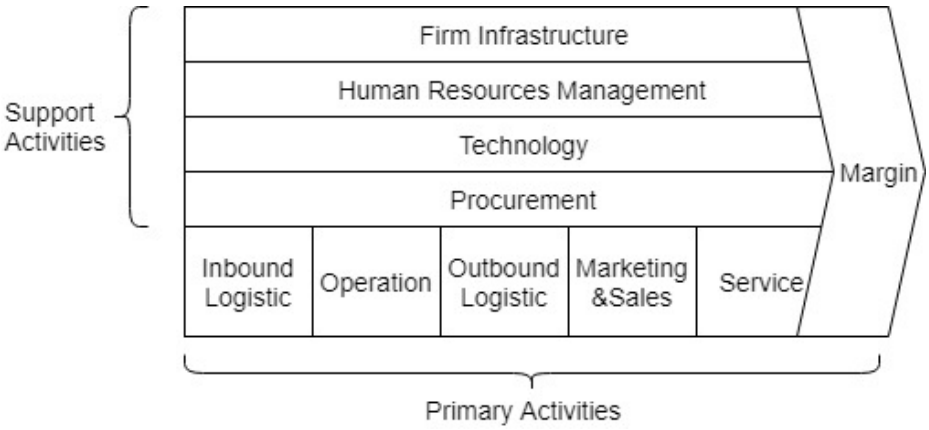


Figure 4-4 Michal Porter's Value Chain

Today, retail enterprises have entered the era of rational profit, and their market competition is tending to the corner of value chain cost. (Ghemawat, Pankaj, 2002) For modern enterprises, it is an important means to enhance customer stickiness and enhance competitive strength by providing continuous added value to customers and forming a complete industrial value chain system. To achieve this, it is necessary for retail enterprises to manage the product flow, the information flow and the capital flow which carries on the conformity management.

Various enterprises in the retail industry sometimes pay attention to highlight some key links in the whole chain and adopt different operating modes in some links in order to highlight their advantages (Gereffi. G, 1994). As a result, different forms of industry are formed. In other words, in each link of value chain, the difference in the realization mode can result in the differentiation of the the business model.

The following chart shows the breakdown of various retail establishments, which are not mutually exclusive. A single retailer can fall into multiple categories at the same time. For example, A department store can be a branch of a chain store, which adopting a store strategy on not only accepting mail-order orders, but also operating websites.

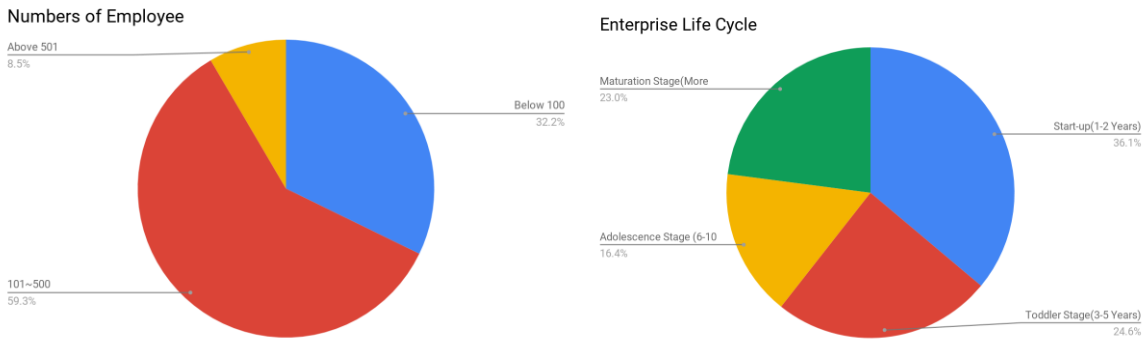
Figure 4-5 different forms of retail industry

4.2 Questionnaire Findings

Based on the statistical analysis of the survey data that collected from the 61 practitioners in the SMRE in China, this section will empirically analyze the application situation of marketing theories and the implementing situation of BI technology in SMRE in China.
In this section, research question 3 to 7 wii be answered and hypothesis 1-10 will be test and verified.

4.2.1 Demographic Profile

Figure 4-6, Figure 4-7 and Table 4-3 shows the demographic profile of the respondents that involved in this questionnaire investigation.



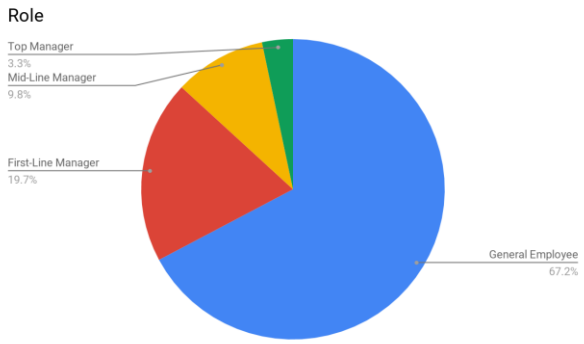


Figure 4-6 Demograhpic information of the respondents

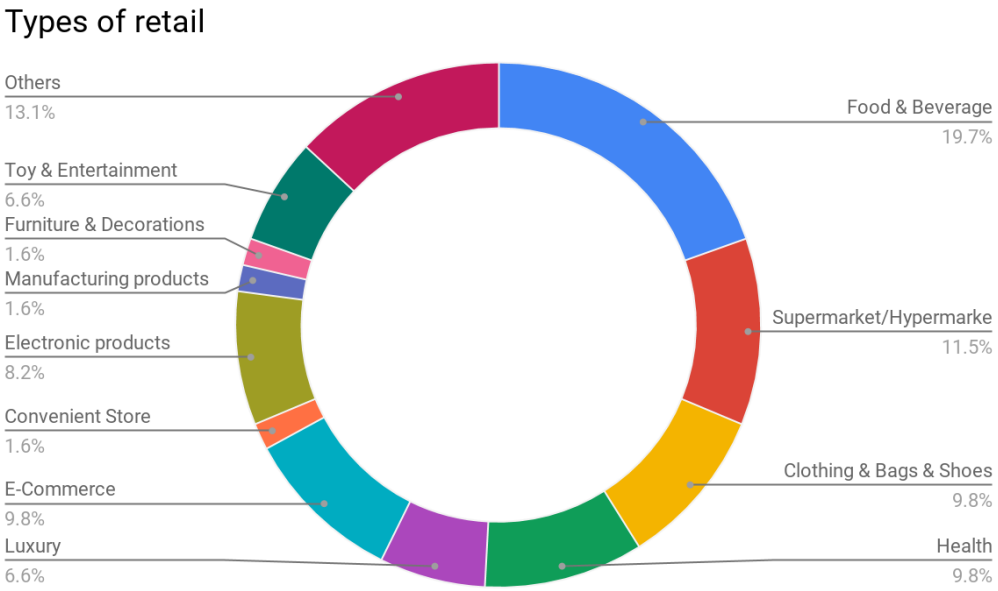


Figure 4-7 Types of retail to that respondents belong to

Summary of valid participants in the questionnaire survey

Question	Option	Numbers	Proportion
Numbers of Employee	Above 501	19	8.5%
	100~500	35	59.3%
	Below 100	5	32.2%
Enterprise Life Cycle	Start-up (1-2 Years)	22	36.1%
	Toddler Stage (3-5 Years)	15	24.6%
	Adolescence Stage (6-10 Years)	10	16.4%
	Maturation Stage (More than 10 Years)	14	23.0%
	Food & Beverage	12	19.67%
	Supermarket/Hyper market	7	11.48%

Types of Retail	Clothing & Bags & Shoes	6	9.84%
	Health	6	9.84%
	Luxury	4	6.56%
	E-Commerce	6	9.84%
	Convenient Store	1	1.64%
	Electronic products	5	8.2%
	Industrial Products	1	1.64%
	Furniture & Decorations	1	1.64%
	Toy & Entertainment	4	6.56%
	Others	8	13.11%
Role	General Employee	41	67.2%
	First-Level Manager	12	19.7%
	Mid-Level Manager	6	9.8%
	Top Manager	2	3.3%

Table 4-3 Summary of valid participants in the questionnaire survey

Due to the sample selection, 59.3% and 32.2%respondents are from the retail enterprises whose number of employee is between 101~500 and below 100 respectively, which is the projected target survey population of this research. Regarding to the enterprise life cycle period, 22 of the 61 respondents are from the start-up companies, which accounts for the biggest proportion (36.1%). The proportion of the retail enterprises in toddler stage, adolescence stage and maturation stage are slightly different, which accounts of 24.59%, 16.39% and 22.95% respectively. Furthermore, most respondents in this survey are general employees in their company, which takes up 67.2% of the total proportion. The rest of respondents are from management level. Only two of them are top managers (3.3%) and first-level manager and mid-level managers carved up the rest of the area, which accounts for 19.7% and 9.8% respectively. As far as retail industry division is concerned, most respondents are served in “Food & Beverage”, followed by” Supermarket/Hypermarket” (11.48%), “Clothing & Bags & Shoes” (9.84%), “Health (9.84%)”, “E-Commerce” (9.84%), “Electronic Products” (8.2%), “Toys & Entertainments” (6.56%), and “Luxury” (6.56%). The proportion of “Furniture & Decorations” and “Industrial Products” only accounts for 3.28% in total. It is worth mentioning that 13.11% respondents select the option of “others”, which are from the omits of the industries.

In sum, the information of demographic statistic has established the projected object basis and delimited a clear boundary of sample for this survey.

4.2.2 Reliability Analysis

Reliability analysis is mainly used to study the internal reliability of the scale. First, it describes the basic statistics of each evaluation item, calculates the simple correlation coefficient of each item and the correlation coefficient between other items after deleting one

item, and makes a preliminary analysis of the intrinsic reliability. Then, various reliability analysis coefficients are used to further study the internal or external reliability. Reliability coefficient is mainly applied to Krombaha a coefficient and half-fold reliability coefficient.

Case Processing Summary

		N	%
Cases	Valid	61	100.0
	Excluded[a]	0	.0
	Total	61	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.988	63

Table 4-4 Results of Reliability Analysis

Based on the fundamental theory of Cronbach's Alpha (Lee Cronbach, 1951), the figure of Cronbach's alpha which is greater than or equal to 0.9 indicates that the reliability of the scale is better. 0.8-0.9 indicates that the reliability can be accepted .0.7-0.8 some items need to be revised, and less than 0.7 indicates that some items in the scale need to be abandoned. According to the analysis results of SPSS, the Cronbach's Alpha of this survey is 0.988, which indicated that the reliability of the scale is in a excellent condition.

4.2.3 Validity Analysis

The KMO(Kaiser-Meyer-Olkin) sample measure test and the Bartlett sphere test are used to test whether the data is suitable for factor analysis. When the KMO value is larger, the more common factors they have among variables, which means the more suitable for factor analysis it is. When KMO is above 0.90, it is supreme suitable; When KMO is between 0.8 and 0.9, it is very suitable; when it is between 0.7 and 0.8 it is suitable; when it is between 0.6 and 0.7, it is slight suitable. The significant probability of Chi-square statistical value in the Bartlett sphere test is 0.000, less than 0.01, which indicates that the data correlation matrix is not a unit matrix and has correlation.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.833
Bartlett's Test of Sphericity	Approx. Chi-Square	1606.172
	df	105
	Sig.	.000

Table 4-5 Results of Validity Analysis

In this case, the KMO is 0.833(higher than 0.8) and the Bartlett's test of sphericity is 0.00(below than 0.01). It indicated that the correlation between quantities is very strong, which accords with the precondition of factor analysis.

4.2.4 Descriptive Statistics Analysis

1.Relationship between the LCP, AoE and the usage of BI.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
What is the amout of employees in the retail enterprise you work for?	61	1	3	1.97	.706
Which is the life cycle period of the retail enterprise you work for?	61	1	4	2.26	1.182
Valid N (listwise)	61				

Table 4-6 Descriptive Statistic of AoE and LCP-SPSS

Table 4-6 shows the descriptive statistics in terms of the AoE and LCP run by SPSS. The minimum value “1” and maximum value “3” represent the retail enterprises whose amount of employee is above 500 and the counterpart is under 100 respectively. The mean of “amount of employee” is 1.97, which demonstrates that the average amount of retail enterprises that involved in the survey is between 100 and 500. Similarly, the mean of “life cycle period” is 2.26, which shows that the average company life cycle is in “Toddler Stage (3-5 years)”.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Type of the Retail	61	1	12	5.41	3.887
Role in Organization	61	1	4	1.49	.809
Valid N (listwise)	61				

Table 4-7 Descriptive Statistic of ToR and RiO

Table 4-7 displayed the individual information of the respondents that involved in this survey. Just as its name implies, the figure from 1 to 12 of “Type of the Retail” represents the different type of retail and role in organization that we defined in Figure 4-7. The mean of ToR and RiO is 5.41 and 1.49, which provided a fundamental demographic statistic of this investigation.

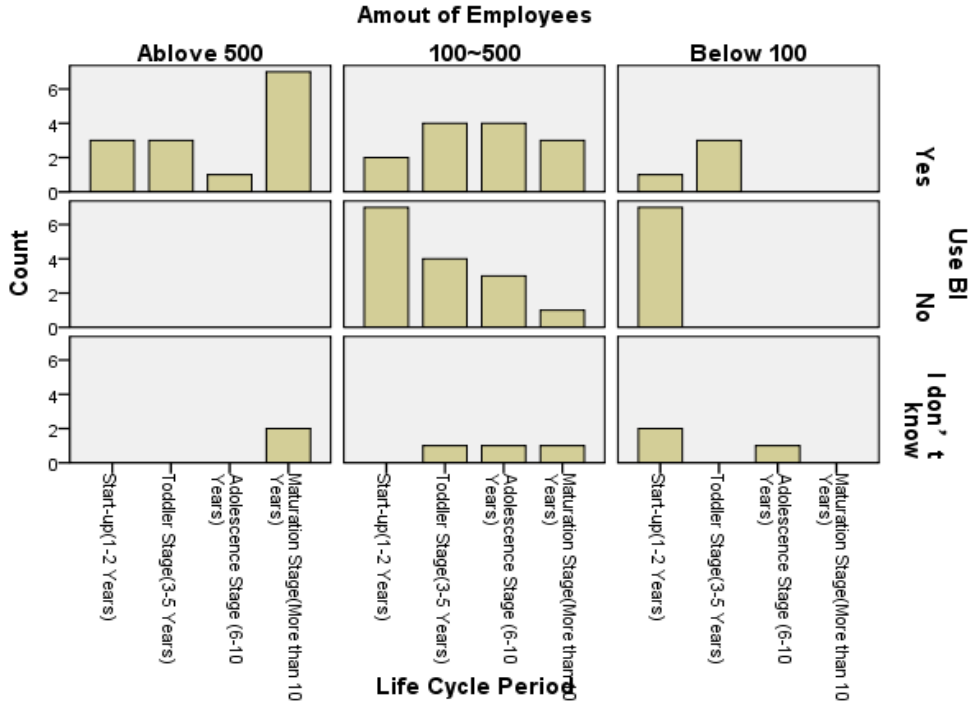


Figure 4-8 The descriptive graph of Number of Employees, Use BI and LCP

Figure 4-8 shows the BI implementing situation in different scales and different life cycle period retail enterprises, which displayed the intuitionistic pattern of the relationship between the LCP, AoE and the usage of BI.

For the relative big retail enterprises whose amount of employee is over 500, if we removed the 2 invalid answers “I don’t know”, all of the rest companies had implemented BI systems already. Apparently, the implementing of BI is independent from the life cycle period for big retail enterprises, which indicates that implementing BI is a universal strategy when the companies reaches the certain scale and stage. For the relative medium retail enterprises whose number of employees is between 100 and 500, the BI applying situation is more complex. From the observation we can draw a primary conclusion that the more mature the medium retail enterprises are, the higher possibility they implement BI. Last, for the relative small retail enterprises whose number of employees is below 100, only a few of them had implemented BI systems, and all of them are in “Start-up (1-2 Years)” and “Toddler Stage (3-5 Years)”.

2.Assessment of marketing consciousness in retail enterprises

The purpose of this question is to get the acquaintance of the marketing consciousness that used in the daily operation of SMRE. We list three common aspects of marketing consciousness that can reflect the level of the management and operation of SMRE. Each level of points scored represent the degree of satisfaction regarding the marketing activities that evaluated by the respondents. Among them, “be familiar with the merchandise and know well of the sales, inventory, KPI etc” can be seen as the essential foundation of the retail operation for SMRE, which is a fact-based management of how efficaciously they manage their sales, inventory data.

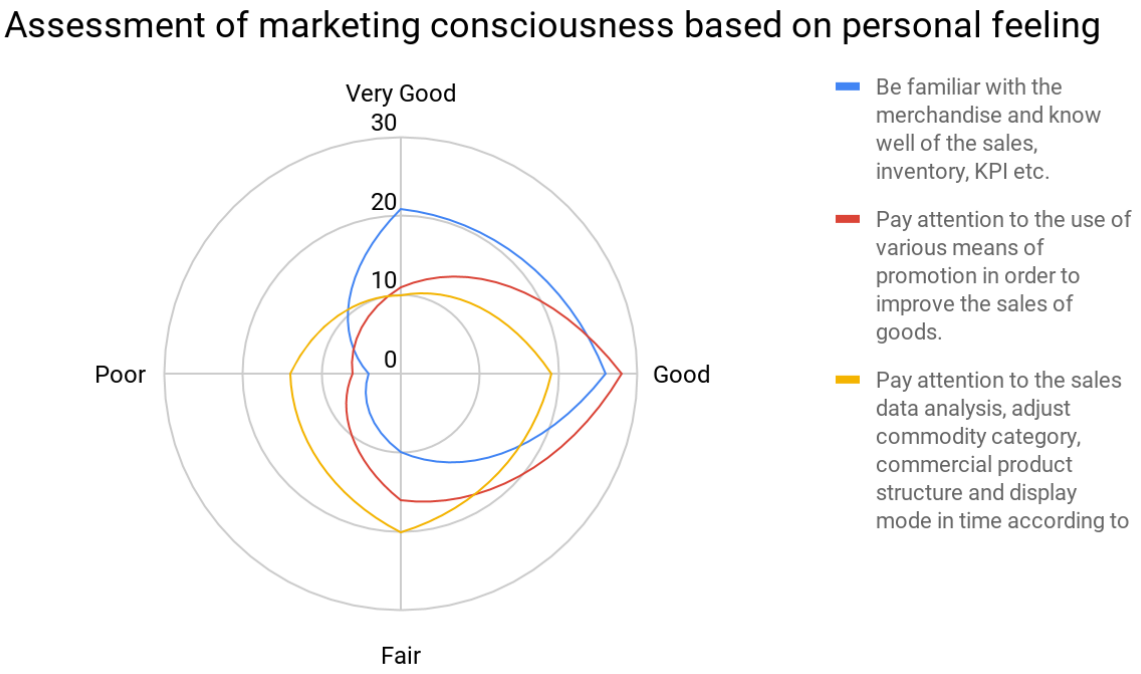


Figure 4-9 Assessment of marketing consciousness based on personal feeling

According to the assessment from 61 respondents, 47 of them (34.4% in “Very Good” and 42.6% in “Good”) has a relative high evaluation on the merchandise management process and only 4 respondents think their company has a negative performance of merchandise management, which can be understood that most SMRE has relative high ability of merchandise operation and management. They can sort and count the inventory and obtain the statistic of sales and KPI in a high efficiency. Interestingly, all of the 4 respondents who thought the company's merchandise management is performing disillusionary are from small start-up retail enterprises, which can demonstrate the dilemma that many small start-ups have deficiency in their routine operations.

4.2.5 The influence of the retail enterprise scale on BI usage, frequency of applying marketing strategies and necessity of marketing.

To testify whether the scale of retail enterprises can affect the implementation of BI, frequency of applying marketing strategies and necessity of marketing, a One-way ANOVA test is conducted. The test results can be seen in table 4-8 and table 4-9.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Use BI	Between Groups	3.625	2	1.813	3.937	.025
	Within Groups	26.703	58	.460		
	Total	30.328	60			
Necessity of Marketing	Between Groups	.203	2	.102	.134	.875
	Within Groups	44.026	58	.759		
	Total	44.230	60			
Frequency of Applying Marketing Strategies	Between Groups	4.581	2	2.290	2.062	.136
	Within Groups	64.435	58	1.111		
	Total	69.016	60			

Table 4-8 The One-way ANOVA test results of the retail enterprise scale on BI usage, frequency of applying marketing strategies and the awareness necessity of marketing

As we defined in 4.2.4, group 1 to 3 represents the retail enterprises in different scale respectively. Group 1 represents the retail enterprises whose amount of employee is over 500, group 2 represents the retail enterprises whose amount of employee is between 100 and 500, and group 3 represents the retail enterprises whose amount of employee is under 100.

From the result of One-way ANOVA test between the groups we can see that the Sig (Use BI) =0.025<0.05, which indicates that there is significant difference between groups regarding the “Use of BI”. On the contrary, the Sig (Necessity of Marketing) =0.875>0.05, Sig (Frequency of Applying Marketing Strategies) =0.136>0.05, which indicates that there is no outstanding difference regarding the “Necessity of Marketing” and “Frequency of Applying Marketing Strategies” between the different enterprise scale group.

Multiple Comparisons

LSD

Dependent Variable	(I) Amout of Employees	(J) Amout of Employees	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Use BI	Ablove 500	100~500	-.427'	.209	.045	-.85	.00
		Below 100	-.679'	.248	.008	-1.18	-.18
	100~500	Ablove 500	.427'	.209	.045	.01	.85
		Below 100	-.251	.218	.255	-.69	.19
	Below 100	Ablove 500	.679'	.248	.008	.18	1.18
		100~500	.251	.218	.255	-.19	.69
Necessity of Marketing	Ablove 500	100~500	.101	.268	.708	-.44	.64
		Below 100	.161	.319	.616	-.48	.80
	100~500	Ablove 500	-.101	.268	.708	-.64	.44
		Below 100	.060	.281	.832	-.50	.62
	Below 100	Ablove 500	-.161	.319	.616	-.80	.48
		100~500	-.060	.281	.832	-.62	.50
Frequency of Applying Marketing Strategies	Ablove 500	100~500	-.508	.324	.123	-1.16	.14
		Below 100	-.750	.386	.057	-1.52	.02
	100~500	Ablove 500	.508	.324	.123	-.14	1.16
		Below 100	-.242	.339	.479	-.92	.44
	Below 100	Ablove 500	.750	.386	.057	-.02	1.52
		100~500	.242	.339	.479	-.44	.92

*. The mean difference is significant at the 0.05 level.

Table 4-9 Multiple Comparisons of the retail enterprise scale on BI usage, frequency of applying marketing strategies and necessity of marketing

Table 4-9 shows the detailed information on the difference of “Use BI” between groups. Specifically, the mean difference of group 1 and group 2 is -0.427 and -0.679, and the mean difference of group 2 and group 3 is -2.51, which can help to draw the conclusion that shows in the table below.

Test	Observation	Conclusion	Hypothesis test result
Use BI	Group 1 is larger than group 2 Group 2 is larger than group 3	The BI popularization rate of large retail enterprises is much higher than that of SMRE.	H1 approved
Necessity of Marketing	No significant difference between groups	The scale of retail enterprise has no influence on the awareness of necessity of marketing	H2 rejected
Frequency of Applying Marketing-mix Strategies	No significant difference between groups	The scale of retail enterprise has no influence on the frequency of applying marketing-mix strategies	H3 rejected

Table 4-10 Hypothesis #1, #2, #3 test results

4.2.6 The influence of the LCP on BI usage

To testify whether the life cycle of retail enterprises can affect the implementation rate of BI, a One-way ANOVA test is conducted. The test results can be seen in table 4-11 and table 4-12.

ANOVA

Use BI

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.855	3	.618	1.238	.304
Within Groups	28.473	57	.500		
Total	30.328	60			

Table 4-11 The One-way ANOVA test results of the LCP on BI usage

Multiple Comparisons

Use BI
LSD

(I) Life Cycle Period	(J) Life Cycle Period	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Start-up(1-2 Years)	Toddler Stage(3-5 Years)	.418	.237	.083	-.06	.89
	Adolescence Stage (6-10 Years)	.118	.270	.663	-.42	.66
	Maturation Stage(More than 10 Years)	.318	.242	.193	-.17	.80
Toddler Stage(3-5 Years)	Start-up(1-2 Years)	-.418	.237	.083	-.89	.06
	Adolescence Stage (6-10 Years)	-.300	.289	.303	-.88	.28
	Maturation Stage(More than 10 Years)	-.100	.263	.705	-.63	.43
Adolescence Stage (6-10 Years)	Start-up(1-2 Years)	-.118	.270	.663	-.66	.42
	Toddler Stage(3-5 Years)	.300	.289	.303	-.28	.88
	Maturation Stage(More than 10 Years)	.200	.293	.497	-.39	.79
Maturation Stage(More than 10 Years)	Start-up(1-2 Years)	-.318	.242	.193	-.80	.17
	Toddler Stage(3-5 Years)	.100	.263	.705	-.43	.63
	Adolescence Stage (6-10 Years)	-.200	.293	.497	-.79	.39

Table 4-12 The Multiple Comparisons of the LCP on BI usage

From the result of One-way ANOVA test, we can see that the Sig value of start-up between other groups is 0.083, 0.663 and 0.193. All of the sig value is bigger than 0.05. Thus, there is no outstanding difference in the use of BI among retail enterprises with different LCP. However, it is worth noting that the sig between “Startups (1-2 Years)” and “Toddler stage (3-5 Years)” is 0.083. It is just a little higher than 0.05. which means that a certain difference does exist regarding the BI usage popularity between the retail enterprise in the two life cycle period. The hypothesis test result can be shown in the table 4-19 below.

Test	Observation	Conclusion	Hypothesis test result
Use BI	No significant difference between groups	The LCP of retail enterprises has no significant influence on using BI.	H4 rejected

Table 4-13 Hypothesis #4 test result

4.2.7 The influence of the frequency of applying marketing strategies on BI usage.

To testify whether the frequency of applying marketing strategies can affect the implementation rate of BI, a One-way ANOVA test is conducted. The test results can be seen in table 4-14 and table 4-15.

ANOVA

Does your company use Business Intelligence system to support your business?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.594	3	3.531	5.717	.002
Within Groups	35.209	57	.618		
Total	45.803	60			

Table 4-14 The One-way ANOVA test results of “the frequency of applying marketing strategies” on BI usage.

In the "Oneway-ANOVA" table, we can see that Sig=0.002 < 0.05, which means there is a significant difference between at least two groups within the four groups which have different frequency of applying marketing strategies.

Multiple Comparisons

Does your company use Business Intelligence system to support your business?
LSD

(I) What is the applying situation of marketing strategies i…	(J) What is the applying situation of marketing strategies i…	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Widely Use	Normally Use	-.433'	.206	.040	-.85	-.02
	Seldom Use	-.891'	.259	.001	-1.41	-.37
	I Don’ t Know	-.800'	.337	.021	-1.47	-.13
Normally Use	Widely Use	.433'	.206	.040	.02	.85
	Seldom Use	-.458	.230	.051	-.92	.00
	I Don’ t Know	-.367	.315	.250	-1.00	.26
Seldom Use	Widely Use	.891'	.259	.001	.37	1.41
	Normally Use	.458	.230	.051	.00	.92
	I Don’ t Know	.091	.352	.797	-.61	.80
I Don’ t Know	Widely Use	.800'	.337	.021	.13	1.47
	Normally Use	.367	.315	.250	-.26	1.00
	Seldom Use	-.091	.352	.797	-.80	.61

*. The mean difference is significant at the 0.05 level.

Table 4-15 The Multiple Comparisons of different frequency of applying marketing strategies on BI usage

More specifically, sig (Widely Use) =0.04<0.05; sig (Normally Use) =0.04<0.05; sig (Seldom Use) =0.01; sig (I don’t know) =0.21 shows that the four different practical degree of applying marketing strategies has a significant difference on whether they implement BI.
mean (Widely Use) =-0.433; mean (Normally Use) =4.33; mean (Seldom Use) =8.91 indicates that for the retail enterprises that have widely usage on the marketing-mix strategies are more likely to implement BI in their business. On the contrary, for those who do not pay much attention on applying marketing-mix strategies, it seems that it is not necessary to implement BI. In the between, for those retail enterprises who apply marketing-mix strategies but not in a high frequency, more than half of them implemented BI. The findings above indicates that the hypothesis of applying frequency(Situation) of marketing

strategies that used in routine retail can influence whether the retail enterprise implement BI is true.

Based on the results above, the hypothesis test result can be shown in the table 4-27 below.

Test	Observation	Conclusion	Hypothesis test result
Use BI	Group 1 is larger than group 2 Group 2 is larger than group 3	The BI popularization rate of the retail enterprises which have high frequency of applying marketing-mix strategies is much higher than the lower ones	H5 Approved

Table 4-16 Hypothesis #5 test results

4.2.8 The influence of the type of retail on BI usage.

To testify whether the types of retail can affect the implementation rate of BI, a One-way ANOVA test is conducted. The test results can be seen in table 4-17 and table 4-18.

Descriptives

Use BI

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Food & Beverage	12	1.67	.651	.188	1.25	2.08	1	3
Supermarket/Hypermarket	7	1.57	.787	.297	.84	2.30	1	3
Clothing & Bags & Shoes	6	1.17	.408	.167	.74	1.60	1	2
Health	6	1.83	.983	.401	.80	2.87	1	3
Luxury	4	2.00	.816	.408	.70	3.30	1	3
E-Commerce	6	1.50	.548	.224	.93	2.07	1	2
Convenient Store	1	1.00	.	.	.	.	1	1
Electronic products	5	1.80	.837	.374	.76	2.84	1	3
Manufacturing products	1	2.00	.	.	.	.	2	2
Furniture & Decorations	1	2.00	.	.	.	.	2	2
Toy & Entertainment	4	1.25	.500	.250	.45	2.05	1	2
Others	8	1.75	.886	.313	1.01	2.49	1	3
Total	61	1.62	.711	.091	1.44	1.81	1	3

Table 4-17 The descriptives of the type of retail on BI usage

ANOVA

Use BI

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.730	11	.339	.625	.799
Within Groups	26.598	49	.543		
Total	30.328	60			

Table 4-18 The One-way ANOVA test results of the type of retail on BI usage

From the result of One-way ANOVA test, we can see that the Sig=0.799>0.05, which demonstrates that there is no significant difference between groups regarding the “types of retail”. Thus, the test result of the hypothesis can be seen as follows:

Test	Observation	Conclusion	Hypothesis test result
Use BI	No significant difference between groups	The types of retail have no influence on the usage of BI	H6 rejected

Table 4-19 Hypothesis #6 test result

4.2.9 The most popular BI system among SMRE

To testify which BI system is the most widely used among SMRE, an independent-Samples T test is conducted. The test results can be seen in table 4-20 and table 4-21.

Group Statistics

	Amount…	N	Mean	Std. Deviation	Std. Error Mean
Use SAP BO	>= 2	45	-1.56	1.739	.259
	< 2	16	.19	1.328	.332
Use IBM Cognos	>= 2	45	-1.60	1.684	.251
	< 2	16	.00	1.265	.316
Use QlikView	>= 2	45	-1.64	1.626	.242
	< 2	16	-.19	1.167	.292
Use Microsoft SQL Server	>= 2	45	-1.62	1.655	.247
	< 2	16	.00	1.265	.316
Use Oracle BI EE	>= 2	45	-1.67	1.595	.238
	< 2	16	-.06	1.237	.309
Use Tableau	>= 2	45	-1.73	1.498	.223
	< 2	16	-.25	1.125	.281
Use SAS	>= 2	45	-1.69	1.564	.233
	< 2	16	-.12	1.204	.301
Use Salesforce	>= 2	45	-1.71	1.532	.228
	< 2	16	-.12	1.204	.301
Use ClearStory Data	>= 2	45	-1.73	1.498	.223
	< 2	16	-.31	1.078	.270
Use TIBCO	>= 2	45	-1.71	1.532	.228
	< 2	16	-.38	1.025	.256
Use Zoomdata	>= 2	45	-1.73	1.498	.223
	< 2	16	-.38	1.025	.256
Use Alteryx	>= 2	45	-1.71	1.532	.228
	< 2	16	-.38	1.025	.256
Use Birst	>= 2	45	-1.71	1.532	.228
	< 2	16	-.38	1.025	.256
Use Domo	>= 2	45	-1.69	1.564	.233
	< 2	16	-.31	1.078	.270
Use Yellowfin	>= 2	45	-1.71	1.532	.228
	< 2	16	-.38	1.025	.256
Use Logi Analytics	>= 2	45	-1.73	1.498	.223
	< 2	16	-.31	1.078	.270
Use Datameer	>= 2	45	-1.73	1.498	.223
	< 2	16	-.38	1.025	.256
Use FineBI	>= 2	45	-1.71	1.532	.228
	< 2	16	-.38	1.025	.256
Use Others	>= 2	45	-1.67	1.595	.238
	< 2	16	-.38	1.025	.256

Table 4-20 The group statistic of BI system among retail enterprises

Based on the feedback from the first respondents to the questionnaire, multiple BI systems could be implemented within in the organization. Accordingly, we set this question to multiple choices. The results of the selection frequency of the BI systems can be seen in Table 4-20. The group statistic above demonstrates that SAP BO(mean=-1.56) is most widely used BI system among SMRE(Amount>=2), followed by IBM Cognos(mean=-1.60) and QlikView(mean=-1.64). Based on the results above, the hypothesis test result can be shown in the table 4-27 below.

Test	Observation	Conclusion	Hypothesis test result
Popularity of BI systems among SMRE	The mean of SAP is the lowest	SAP is the most widely used BI system among SMRE	H7 approved

Table 4-21 Hypothesis #7 test result

4.2.10 The plan of implementing BI

To investigate whether the retail enterprises that have not implemented BI have plans to launch it within three years, a graph with option “Yes” and “No” is drawn up based on the feedback from respondents. The graph can be seen in Figure 4-10.

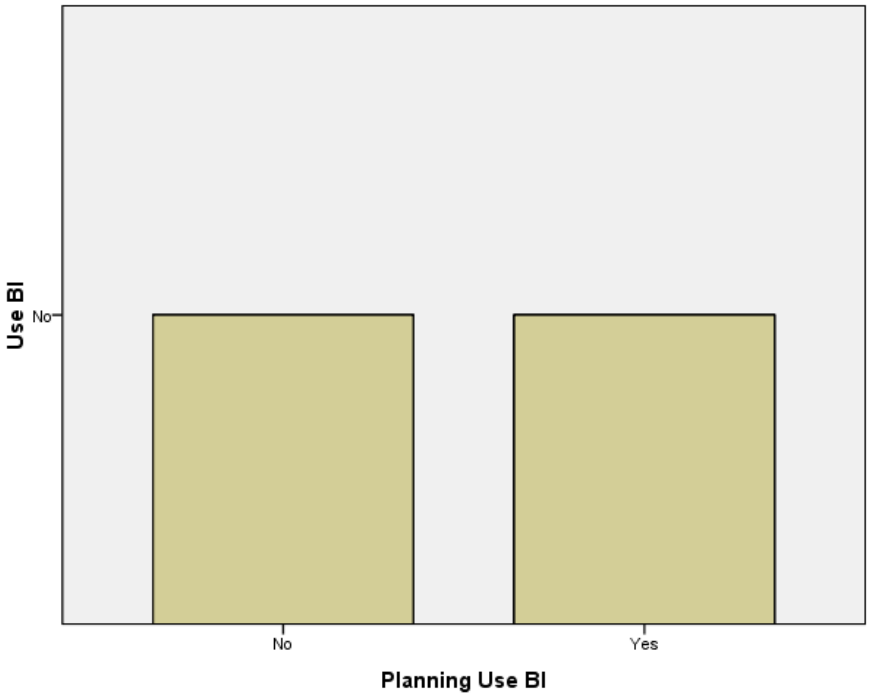


Figure 4-10 “Yes” or “No” of planning to implement BI

Figure 4-10 shows the results of whether the retail enterprises that do not use BI would like to implement BI within 3 years. According to the figure, it is obvious that the answer “No” and “Yes” is in the same amount. Based on the results above, the hypothesis test result can be shown in the table 4-22 below.

Test	**Observation**	**Conclusion**	**Hypothesis test result**
Plan of implementing BI within 3 years	The amount of “No” is equals to “Yes”	For the SMRE that have not yet implemented BI, the number of companies expected to implement	H8 rejected

	BI and not to implement BI is the same

Table 4-22 Hypothesis #8 test result

To find out what prevent the retail enterprises from implementing BI, a further question is proposed in the questionnaire. Figure 4-11 shows the reason that why the retail enterprises did not implement BI yet.

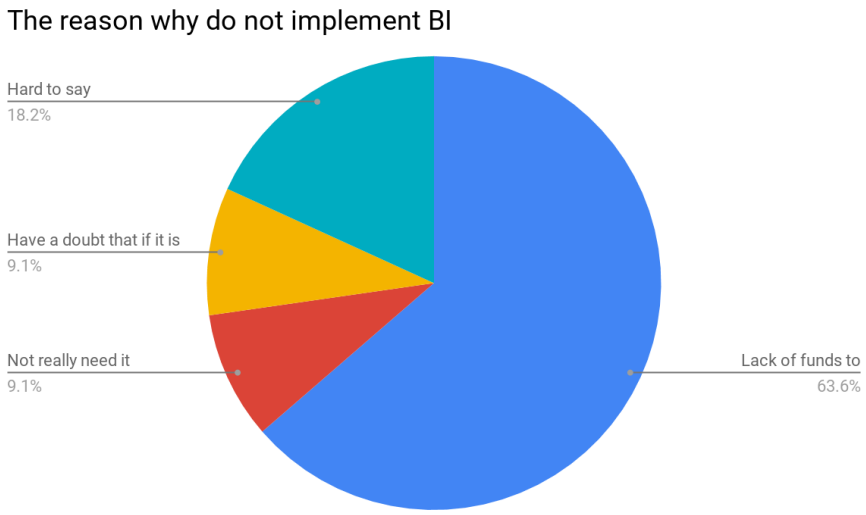


Figure 4-11 The reason why do not implement BI

According to the results of the reason why do SMRE do not implement BI, more than 60 percent respondents choose" Lack of funds to purchase/develop" which indicates that the cost of purchasing or developing and even also maintenance on BI can hardly be affordable by the SMRE. The option "Hard to say" is on the second position, whose proportion is 18.2%. The percentage of "have a doubt that if it is necessary" and "Not really needed" only accounts for 9.1% simultaneously, which can help us to draw an initial conclusion that even if most of SMRE have the consciousness of the importance of the marketing analysis and know how much a BI system can benefits the business, however, compared to the investment of implementing BI, the ROI of implementing BI is in a relative low level.

4.2.10 BI Satisfaction Investigation

To investigate the functional satisfaction of the BI systems during the using, an independent-Samples T test is conducted. The test results can be seen in table 4-23 and table 4-24, table 4-25 and table 4-26.

- Satisfying Function

Group Statistics

	Amount…	N	Mean	Std. Deviation	Std. Error Mean
Fcuntion Satisfed-Cloud BI	>= 2	45	-1.60	1.684	.251
	< 2	16	-.06	1.237	.309
Fcuntion Satisfed-Self-service Metadata Management	>= 2	45	-1.58	1.712	.255
	< 2	16	-.25	1.125	.281
Fcuntion Satisfed-User-defined ETL & Data Storage	>= 2	45	-1.62	1.655	.247
	< 2	16	-.25	1.125	.281
Fcuntion Satisfed-Aggregation Packages	>= 2	45	-1.60	1.684	.251
	< 2	16	-.19	1.167	.292
Fcuntion Satisfed-Analysis Panel	>= 2	45	-1.60	1.684	.251
	< 2	16	.12	1.310	.328
Fcuntion Satisfed-Interactive Visualization	>= 2	45	-1.58	1.712	.255
	< 2	16	-.31	1.078	.270
Fcuntion Satisfed-Automatic Searching	>= 2	45	-1.58	1.712	.255
	< 2	16	-.06	1.237	.309
Fcuntion Satisfed-Mobile Version	>= 2	45	-1.60	1.684	.251
	< 2	16	-.25	1.125	.281
Fcuntion Satisfed-Self-service Data Preparation	>= 2	45	-1.69	1.564	.233
	< 2	16	-.31	1.078	.270
Fcuntion Satisfed-Others	>= 2	45	-1.73	1.498	.223
	< 2	16	-.31	1.078	.270

Table 4-23 The group statistics of satisfying function

Table 4-23 shows the most satisfying BI function during the using. Interestingly, for SMRE (>=2), we can see that the most satisfied function is “Metadata Management”, “Interactive Visualization” and “Automatic Searching” simultaneously, whose mean is all -1.58. Based on the results above, the hypothesis test result can be shown in the Table 24 below.

Test	Observation	Conclusion	Hypothesis test result
The most satisfied BI function	The mean of “Metadata Management”, “Interactive Visualization” and “Automatic Searching” is same.	For SMRE, the most satisfied functions of the BI that they implemented are “Metadata Management”, “Interactive Visualization” and “Automatic Searching”	H9 approved

Table 4-24 Hypothesis #9 test result

- Unsatisfied Functionality

Group Statistics

	Amount	N	Mean	Std. Deviation	Std. Error Mean
Fcuntion Unsatisfed-Cloud BI	>= 2	45	-1.71	1.532	.228
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Self-service Metadata Management	>= 2	45	-1.73	1.498	.223
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-User-defined ETL & Data Storage	>= 2	45	-1.56	1.739	.259
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Aggregation Packages	>= 2	45	-1.67	1.595	.238
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Analysis Panel	>= 2	45	-1.64	1.626	.242
	< 2	16	-.12	1.204	.301
Fcuntion Unsatisfed-Interactive Visualization	>= 2	45	-1.58	1.712	.255
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Automatic Searching	>= 2	45	-1.64	1.626	.242
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Mobile Version	>= 2	45	-1.60	1.684	.251
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Self-service Data Preparation	>= 2	45	-1.69	1.564	.233
	< 2	16	-.19	1.167	.292
Fcuntion Unsatisfed-Others	>= 2	45	-1.69	1.564	.233
	< 2	16	-.31	1.078	.270

Table 4-25 The group statistics of unsatisfying function

Table 4-25 shows the most satisfying BI function during the using. For SMRE (>=2), we can see that the most unsatisfied function is “User-defined ETL & Data”. Based on the results above, the hypothesis test result can be shown in the table 4-26 below.

Test	Observation	Conclusion	Hypothesis test result
The most unsatisfied BI function	The mean of “User-defined ETL&Data” is the smallest.	For SMRE, the most unsatisfied function of the BI that they implemented is “User-defined ETL&Data”.	H10 rejected

Table 4-26 Hypothesis #10 test result

4.2.11 Summary of hypothesis testing

Table 4-27 shows the summary results of the hypothesis test conducted in 4.2.

	Hypothesis	Test Result
H1	At present, the popularity of BI in SMRE is lower than that in BRE	Approved
H2	The consciousness of the necessity of marketing means in SMRE is weaker than that of BRE	Rejected
H3	The situation of applying marketing-mix strategies in SMRE is weaker	Rejected

	than that of BRE	
H4	The BI implementing rate of SMRE startups is lower than that of SMRE in other LCP.	Rejected
H5	The SMRE that using BI are those who pay attention to marketing-mix strategies and promotion activities	Approved
H6	There is significant difference between different types of retail on BI usage.	Rejected
H7	SAP is the most frequently using BI system among the SMRE	Approved
H8	For SMRE that have not yet implemented BI, most of them have the plan to launch BI within 3 years.	Rejected
H9	For SMRE that implemented BI, the most satisfying BI function is the “Interactive Visualization”	Approved
H10	For SMRE that implemented BI, the most unsatisfying BI function is the “Mobile Version”	Rejected

Table 4-27 The summary of hypothesis testing

According to table 4-27, only four of the ten hypothesis we put forward at the start of this research are approved, which indicates that the actual implementation of BI and the awareness of marketing-mean applications in SMRE of China is much positive than my envision. Specifically, from the results of the hypothesis testing we can draw a conclusion that the popularity of BI in SMRE is still in a relative low level. The implementation of BI is becoming popular increasingly among the relative medium sized retail enterprises. However, the BI application situation of small retail enterprises is still not optimistic. Because of financial constraints, although they are fully aware of the importance of marketing analysis and the benefits that BI can bring to them, very few small retail businesses are willing to spend a lot of money on BI applications. To some extent, it is a paradoxical phenomenon since they all know BI is an effective tool to analyze the data thereupon then can help retail enterprises have rational marketing-mix strategies, but they still did not implement BI in their business and even refuse to launch it within 3 years. In this case, due to the fact that SMRE does not require as much function richness and depth as large enterprises, if there is a BI system that can not only meets SMRE's functional capabilities but also costs less, I believe its market foreground will be very bright and promising.

4.3 Semi-structured Interview Findings

Based on the code and labels that summarize from the interview transcription, this section will textually analyze the marketing means that the SMRE are applying, the core competence and competitive advantages, the trend of SMRE and problems that they are facing with.

In this section, research question 9 to 12 will be answered and hypothesis 11 to 14 will be test and verified.

4.3.1 Core competencies and competitive advantages of SMRE

The effective information about the core competencies and competitive advantages that we extracted from the interview is shown in the following table.

Code	Scope	Interviewee
#USP_as_core_competence	#core_competence	A
#service_as_important_competence	#core_competence	A

#low_price_as_core_competence	#core_competence	B
#low_price_advantage	#competitive advantages	B
#good_location_advantage	#competitive advantages	B
#supplier_stability_advantage	#competitive advantages	B
#major_brand_sponsorship_advantage	#competitive advantages	B
#mobile_payment_advantage	#competitive advantages	B
#brand_impact_as_advantage	#competitive advantages	A
#original_as_advantage	#competitive advantages	A
#collaboration_as_advantage	#competitive advantages	A
#webshop_as_advantage		
#multi-channel_propaganda_as_advantage	#competitive advantages	A

Table 4-28 Code and scope in core competence and competitive advantages

According to the code labeled from the two interviewees and the scope we defined, the core competencies and competitive advantages of the Chinese retail industry can be drawn as below.

Small retail enterprises only determine their competitive advantages and core competitiveness based on "Back Office" factors, and medium retail enterprises know how to give full play to their advantages on formulating suitable development orientation.

Through interviews, we found out that the primary goal of most small retail enterprises is to survive rather than expand business. Due to the limitation of the size of the enterprise, small retail enterprises are not likely to invest a lot of capital to optimize their product structure, both in product quality or portfolio richness. Instead, they put their insights into the low-end consumer market, and try to attract more consumers by offering low priced goods. That is to say, for small retail enterprises, as far as possible, small profits and quick turnover are their core competitiveness in the fierce competition in the retail industry. Also, in interview #1, we can see that the competitive advantages that it deemed itself are all from external angel without exception, like" good_location","supplier_stability","sponsorship" etc, which indicates that for many small retail enterprises tend to have a mistake of taking the "Front Office" environment over-seriously, while ignoring the improvement within the enterprise and itself. On the other side, the industry analysis in medium retail enterprises is much better than that in small retail enterprises. Compared with those small retail enterprises, it is obvious that medium-sized retail enterprises have more pertinence on their business direction. For medium retail enterprises, the financial strength is stronger. Due to the so-called fact that "economic base can determine the superstructure", after having sufficient capital and conditions to identify their competitive advantages and research on the market and the competitors, they are more likely to use their findings to hit a certain direction, which can help them to expand their business and create a stable position in the competition. In interview #2, as a boutique buyer's retailer, it has its own unique business philosophy. From "Front Office" aspect, the geographical distribution of their stores is very reasonable, and suppliers' channels are also very stable. Concerning the new trend of e-commerce, they also launched the online-shop. From "Back Office" aspect, they push-off limited edition of the collaboration and original design clothing and accessories to consumers to create brand impact among the oriented consumer group, which is the key competitive advantages they radicate unambiguously before every decision making.

Combining with the results that we summarized from session 4.2 and the five forces model from Michael Porter, we think that SMRE should consider both “Front Office” and “Back Office” analysis to establish its core competitiveness and competitive advantage.

4.3.2 Marketing strategies

The effective information about the marketing strategies that we extracted from the interview is shown in the following table.

Code	Scope	Interviewee
#crossover_as_product_strategy	#product_strategy	A
#retro_as_product_strategy	#product_strategy	A
#original_as_product_strategy	#product_strategy	A
#provide_more_choice	#product_strategy	B
#meet_more_consumers_needs	#product_strategy	A B
#branch_expanding_as_development_strategy	#development_strategy	A
#expanding_Europe_market_as_development_strategy	#development_strategy	A
#no_low_end_parity_products	#development_strategy	A
#fashion_chaser	#target_customers	A
#serving_surranding_community_residents	#target_customers	B
#daily_necessities_outermost_side	#commodity_display_pattern	B
#fresh_food_intermost_side	#commodity_display_pattern	B
#variable_color_label_for_products	#commodity_display_pattern	B
#promotion_poster	#marketing_means	A B
#commodity_distribution_sign	#marketing_means	B
#new_media_advertising	#marketing_means	A B
#official_website	#marketing_means	A
#email_subscription	#marketing_means	A
#easy_distinguish_as_principle	#marketing_principles	B
#easy_reaching_as_principle	#marketing_principles	B
#first_come_first_go_as_principle	#marketing_principles	B
#products_relevance_as_principle	#marketing_principles	B
#high_profit_priority_as_principle	#marketing_principles	B

Table 4-29 Code and scope in marketing strategies

1. The managers of small retail enterprises have mastered the knowledge of primary marketing and have a certain marketing strategy; however, the marketing strategy is not niche targeting and the marketing means are not rich as well. Medium retail enterprises have clear target customers and the means of sales strategies according to their own positioning.

Table 4-29 has reflected the phenomenon above evidently. Regarding the product development strategy, as the owner of the small community supermarket, interviewee B replied that they would try to satisfy more customers’ needs as much as possible, but there is no further schematization on what they would do to achieve this goal. This is a very broad answer and in the actual strategy formulation, we believe that the unclear product development strategy will not play a practical role in the daily management and operation. Even worse, there is no any formulation on their development strategy. The reasons we have discussed in the last section, which is they put the survival in the supreme position

without considering how to expand their business or set a higher stage. Just like human beings, when food and clothing become problems, people will never consider a higher level of spiritual and material pursuit. The same as retail enterprises. However, the goal of "survival" is not contradict with setting the long-term development strategy. The formulation of development strategy will not have negative influence on the current business strategy but will provide a guidance direction for the series of decision makings. In the long run, the enterprise should be bound to have a better development. Last but not the least, it is worth affirming that the manager of this small supermarket has applied many principles and means on displaying goods, which is a positive indication that the management and operation of the supermarket is not in chaotic and blind. It still has its advantages and space for development.

From the feedback of interviewee A, we can know that the company has developed three product development strategies, which is crossover, retro and original. For development strategies, medium retail enterprises also have clear and specific strategies, such as opening up the European market within three to five years, and not developing PoP products etc.

Combining with the results that we summarized from session 4.2, we think that the medium retail enterprises have far greater ability to formulate strategies for the market than small retail enterprises.

4.3.3 The trend of retail industry

The effective information about the trend of retail industry that we extracted from the interview is shown in the following table.

Code	Scope	Interviewee
#chain_management	#industry_trend	A B
#gap_marketing_strategy	#industry_trend	A
#trend_of_polarization	#industry_trend	B
#moving_towards_ networking	#industry_trend	A B

Table 4-30 Code and scope in industry trend

According to the code labeled from the two interviewees and the scope we defined, the four trends of the Chinese retail industry can be drawn as below.

1.Chain Management becomes the main trend

According to the feedback from two interviewees, they both mentioned that the traditional department store is facing the severe challenge that brought by the chain operation. The supermarket of interviewee B even was sponsored by a major domestic supermarket. Similarly, big retail enterprises like Walmart and Carrefour all expand their scale of business by chain operation, which have brought them more broad market and potential benefits. Under the stress of the faint market share, more and more small and medium retail enterprises have to think over their prospects for development. For many SMRE, one of the most common and effective way is to become a branch store of the big retail enterprises. Relying on the brand advantages and advanced management methods, it can enhance the competitiveness of enterprises and the ability to resist risks, and quickly realize the integration and reorganization of various commercial resources.

2. Gap marketing strategy

It was mentioned in the response from interviewee A. With the improvement of people's living standards, consumers become more active in purchasing, and their behaviors become diversified and individualized. Small and medium-sized retail enterprises, as the closest to consumers, are relatively easy to grasp the changing needs of consumers on the first hand and the information they get is more detailed and targeted than large retail companies. For Large retail enterprises, because of the large scale of their business, normally they can not cover every nook of the market. As a result, sometimes they are more likely to ignore some personalized needs of some certain consumers. However, these forgotten cracks can bring a lot of room for the survival of small and medium-sized retail enterprises.

3. Growing trend of polarization

It was mentioned in the response from interviewee B. Fierce competition has led to an extremely clear trend of polarization in the retail industry as a whole, especially for small and medium retail enterprises. On the one hand, some SMRE began to specialize their management, which is to provide differentiated and personalized services and products according to customers' needs through the use of exclusive shop. On the other hand, market centralization in retail enterprises is gradually increasing, which is a situation that many SME are purchased and merged by those giants in the industry. As a result, a small number of chain giants controlling a large share of the entire retail business, and the rest of small retailers is walking towards bankruptcy.

4. Moving towards networking

Both interviewee A and B mentioned that the retail industry is moving towards networking, especially in China. In recent years, the development of electronic commerce has also led to the rapid marriage between retail enterprises and the Internet, from which we can foresee that it would lead to a revolution in the retail industry. With the development of e-commerce and mobile application, the traditional competition pattern and management mode has changed greatly. Due to the pressure of the prime cost like renting, water and electricity in physical stores and the development free online shopping platform like Taobao, more and more small and medium retail enterprises launched their "new shop" through Internet, some of them even shut down their physical stores. Mobile Internet and social network marketing are driving the new trend of this consumption pattern at the same time. Therefore, the competition in the future is no longer a single product competition, no longer the competition of the channel, but the competition of the integration of resources, and the competition of the terminal consumers.

4.3.4 Problems and challenges

The effective information about the problems and challenges that we extracted from the interview is shown in the following table.

Code	Scope	Interviewee
#lack_of_systemtic_marketing_strategies	#problem	A
#single_use_of_promotion	#problem	A
#insufficient_attention_of_the_value_ of services_images_and_people	#problem	B
#unconsciousness_of_enterprise_culture	#problem	B
#adapt_to_changes_of_purchasin_ habits	#challenge	A B
#optimize_logistics_and_supplier inventory	#challenge	A B

#taking_advantages_of_customer_data	#challenge	A B
#balance_innovation_and_sustainable_ development	#challenge	A

#enterprise_culture_as_core_brand_positioning	#enterprise_culture	A
#energetic_young_as_enterprise_culture	#enterprise_culture	A
#break_frame_of_thought	#enterprise_culture	A
#capture_prophetic_fashion_tendency	#enterprise_culture	A
#no_enterprise_culture	#enterprise_culture	B
#title_sponsorship_by_a_major_brand	#sponsorship	B
#regular_submission_of_sales_data	#management_nature	B
#independent_operation	#management_nature	B
#no_brand_ image_consciousness	#organizational_deficiency	B
#single_use_of_promotion_means	#organizational_deficiency	B
#lack_of_training_on_BI_to_employees	#organizational_deficiency	B

Table 4-31 Code and scope in problems and challenges

1.Problems

According to the code results of the interviews, several problems that existed in SMRE can be concluded as follows:

1) Lack of systematic marketing strategies

From the table we coded from the conversations, we can have a primary conclusion regarding the problems of SMRE. In China, except for the new generation of new retailers (i.e e-commerce), most SMRE are the transformation of the old shoppe, whose capital foundation is weak and technical level is low. Particularly, the application of marketing strategies is extremely backward and most of them still regard the marketing as the sale. The lack of the awareness of marketing strategies and related analysis and practice will directly affect the core competence of small and medium retail enterprises in the competition. Normally, their business philosophy is lagged behind since many of them are still in the stage of "peddlery", which means that they do not aware the importance of the analysis and research of consumer behavior, neither paying much attention to customer loyalty and satisfaction, nor neglecting the creation of value.

Also combining with the survey" the Implementing Situation of Business intelligence in Retail Enterprises", the retail enterprises, especially small and medium retail enterprises lack the awareness and sensitivity of the constant-changing customer demand and building up customer loyalty or consumption habit. Also, only a few of them pay attention to the analysis and investigation of the customers behaviors and philosophy.

2)Single use of promotion

From the coding table we can see that for SMRE in China, the means of marketing strategies are relative simplex and deficient. Imitating is one common phenomenon for those retail enterprises when facing competition. For instance, when their competitors cut the price of their products, the normal action for those retail enterprises is to simply cut the price at the same time just like their competitors did. In addition, the SMRE in China are more likely to use buy one and get one for free, discount and other promotion means, instead of increasing the added value of the products itself. There are also a number of merchants implement

preferential sales by handling membership cards. Price promotion can only solve the temporary problem and achieve the goal in the short term, but it is harmful to the long-term management, which is one of the reasons why the small and medium-sized retail enterprises can not survive in the long run. Some retailers even raise prices deliberately before discount sales on the eve of major festivals. These unfair competitions not only disrupted the market order but also will lead to the consumer trust crisis.

3) Insufficient attention and awareness of the value of services, images and people
According to the response from interviewee B, we can clearly see that some of the SMRE in China has insufficient attention and awareness of the value of service, image and people. According to the Customer Delivered Value Theory by Philip Kotler, to win over the consumer, either reduce the cost of the consumer's purchase process, or raise the value of the consumer's purchase process. In the period of commodity shortage and demand balance, the goods can be favored by consumers as long as the quality is general or there are some characteristics of the goods. However, it is not enough to only have product features and simple sales promotion. First-class services should also be involved. However, service is easy to be ignored when comparing intangible products with shaped products. In my investigation, it is found that the employees in small and medium-sized retail enterprises are easy to be ignored by the "boss", so it is obvious that the "boss" has a vague understanding of the value of service and has not carried out a detailed investigation and study.

4) Unconsciousness to create enterprise culture
Like it shown in table 4-31, traditional SMRE are small, usually seen as storefronts, rather than enterprises. Shopkeepers are called bosses, with poor social responsibility and are not treated as entrepreneurs. The basic modes of business operation are still peddling, which is a way of buying at a low price and selling at a higher price. The focus of the enterprise is to earn the price difference and normally they do not pay attention to the enterprise culture and emotional factors. As a result, the employee mobility is high and their loyalty and responsibility in their working is also in a low level. In the same way, the consumer conversion costs are also not high, which means it is difficult to form customer loyalty.

2.Challenges
According to the code results of the interviews, 4 challenges that potentially threat the SMRE can be concluded as follows:

1) How to adapt to the rapid changes in customer purchasing habits
From the interview we can concludes that the development of Internet and e-commerce technology, the popularity of social media, the access of retail customers to commodity information, procurement and delivery methods have brought great challenges to the pre-selling and after-selling session for traditional retail enterprises. According to ShopperTrak statistics, with the shortened holiday and the abrupt turn of the cold weather, nearly 15% of the consumers in 2017 moved to online shopping from traditional shopping malls during the Christmas and new year, which presage that the fading of traditional physical stores is inevitable.

2) How to use the cooperation and optimization of logistics and supplier inventory to improve the efficiency of supply chain and reduce the cost at the same time.

The second challenge that we derived from the interviews is that the management of traditional retail enterprises has developed into a certain malpractice. One of the most obvious disadvantages is the excessive operating and management costs. Due to the fact that the benefit of retail enterprises is proportional to the operation efficiency, establishing a closed loop management system of capital flow and information flow have become the requirement of the situation. Among them, the cost of circulation and inventory greatly occupy the cost of retail enterprises and upstream suppliers. Those who can accurately understand the market and customer needs have the ability to optimize their logistics and inventory management on this basis. Of course, the management of suppliers is always a management difficulty for the retail enterprises.

3) How to make use of the life cycle information of customer consumption to extend the competition of differentiation on the planning and design of products (services) to improve the core competence.

The third challenge is that some of the industry's pioneers have been collecting more and more customer information on all aspects, which brought a new round of upgrading to the competition of the whole retail industry. The object of this information is for the precision marketing. Specifically, customer consumption and use of goods can also be extended to the design link. The design here includes personalized design at all levels of the product, service, delivery mode, and marketing mode. Obviously, the concept of customer-centered management will inevitably lead to the demand and competition for customers to obtain all kinds of information resources

4)How to integrate the systematic innovation ability into the enterprise strategy and sustainable management.

Talent, technology, process, should be combined as the key element of systematic innovation. The strategy of many retailers is the transformation, however, the biggest challenge that the transition faces is the lack of talents in IT technology, new category, logistics specialty and finance specialty etc. Moreover, it is another challenge to understand whether it can be understood from the headquarters management posts to the front-line staff, and whether the Internet thinking and Internet awareness can be transformed.

4.3.5 Does BI have significant benifits to the daily operation

The effective information about whether BI have significant benefits to the daily operation that we extracted from the interview is shown in the following table.

Code	Scope	Interviewee
#data_non- interoperability	#BI_usage_defficiency	A
#database_independent_between_subdiaries	#BI_usage_defficiency	A
#multiple_data_management_software	#BI_usage_defficiency	A
#complicated_summrization	#BI_usage_defficiency	A
#data_redundency	#BI_usage_defficiency	A B
#data_updating_lag	#BI_usage_defficiency	A
#lack_of_prediction_function	#BI_usage_defficiency	A B
#BI_only_act_as_a_report_tool	#BI_usage_defficiency	A B
#no_analysis_on_customer_behaviour	#BI_usage_defficiency	B
#no_investigation_on_customer_psychology	#BI_usage_defficiency	B
#no_market_statistic	#BI_usage_defficiency	B
#easy_to_use_dashboard	#BI_usage_highlights	A
#intuitionistic_report_forms	#BI_usage_highlights	A B

#automatic_inventory_statistic	#BI_usage_highlights	A B
#brand_statistic	#BI_usage_highlights	A B
#sales_comparison_between_brands	#BI_usage_highlights	A B
#sales_comparison_between_categories	#BI_usage_highlights	A B

Table 4-32 Code and scope in BI usage

According to the answers from the interviewees, the application of BI in SMRE is not satisfactory enough. Although interviewee A and interviewee B both pointed out that BI has many highlights in their operation and management, like “the dashboard is easy to use”, “sales comparison between brands is very clear” and “it can update the statistic the inventory automatically”, etc, combing with the results we summarized from the questionnaire (only 54.55% respondents think the BI they are using have reached their expectation), there is still a lot of room for the functionality improvements. For example, in the interview, interviewee A complained that the sales data in different regions are stored in different databases, and it would be very troublesome when the sales managers of two places needed to unify the data or compare the sales of a product in different areas. Last but not the least, both of them think the BI system they are using have the problems of data redundancy and lack the function of prediction. Combining with the results that we summarized from session 4.2, many functions have the need to be improved.

4.3.6 Summary of Hypothesis testing

Based on our findings in section 4.3, Hypothesis #11 to #14 are validated. Table 4- shows the summary results of the hypothesis test conducted in 4.3.

Table 4-33 Marketing level hypothesis testing result

	Hypothesis	**Test Results**
H11	The core competence of SMRE is the low price	Approved in SRE Rejected in MRE
H12	The trend of SMRE is centralization and e-commerce	Approved
H13	BI can help SMRE applying their marketing-mix strategies and promotion means significantly in the operation.	Rejected
H14	The SMRE do not have the consciousness of establishing brand image and enterprise culture	Approved in SRE Rejected in MRE

According to table 4-33, it indicates that H12 is approved and H13 is rejected. For H11 and H14, the situation is different in small retail enterprises and medium retail enterprises. So, we did not simply divide test results into approved and rejected but have a classified discussion. To be specific, H11 is approved in SRE but rejected in MRE, so does H14.

4.4 Secondary Research

To test and validate the conclusions that we summarized in section 4.3, a secondary research which includes complementary interviews and document reviewing is conducted.

4.4.1 Complementary Interview

To validate whether our findings can represent the ubiquitous and common problems within the SMRE, a complementary interview on two more retail practitioners C and D who is from SRE and MRE respectively is conducted. In this session, we compared the results of the complementary interview with the findings we summarized in session 4.3. Table 4-34 shows the rate of if the respondent agrees with our statements according to Likert scale (Likert, 1932).

Findings	Description	Scope	Likert Scale * C	Likert Scale I D
#1	Small retail enterprises only determine their competitive advantages and core competitiveness based on “Back Office” factors.	Core Competences& Competitive Advantages	5	N. A
#2	Medium retail enterprises know how to give full play to their advantages on formulating suitable development orientation both from “Front Office” and “Back Office” analysis.	Core Competences& Competitive Advantages	N. A	4
#3	The marketing strategy of small retail enterprises is not niche targeting and the marketing means are not rich as well.	Marketing Strategies	4	N. A
#4	Medium retail enterprises have clear target customers and the means of sales strategies according to their own positioning.	Marketing Strategies	N. A	4
#5	Chain Management becomes the main trend	Marketing trends	5	4
#6	Gap marketing strategy becomes the trend	Marketing trends	3	5
#7	Growing trend of polarization	Marketing trends	5	5
#8	Moving towards networking	Marketing trends	5	5
#9	Lack of systemtic marketing strategies	Problems	4	3
#10	Single use of promotion	Problems	5	3
#11	Insufficient attention and awareness of the value of services, images and people	Problems	5	1
	Unconsciousness to create enterprise culture	Problems	5	2
#12	How to adapt to the rapid changes in customer purchasing habits	Challenge	5	5
#13	How to make use of the life cycle information of customer consumption to extend the competition of differentiation on the planning and design of products (services).	Challenge	4	5
#14	How to integrate the systematic innovation ability into the enterprise strategy and sustainable management.	Challenge	4	5
#15	There is still a lot of room for the functionality improvements	BI Prospectus	5	5

*Likert Scale 1=lowest, 5=highest

Table 4-34 Comparison results basd on Liker Scale

From the comparison results, we can see that the biggest part of controversy lies in the problems within SMRE. Interviewee C and D showed a completely opposite attitude towards our description of #10, #11, #12, which indicates that the problems we found in SMRE tend to be more obvious in small retail enterprises, and rarely exist in medium-sized retail

enterprises. But in general, we can see that most of our findings have been supplemented by the complementary interviewee C and D.

4.4.2 Document Review

To have a further contemplation on the Chinese retail industry and the trend of BI, a document review on related official reports and documents that published by authorities or industry associations is conducted. Unfortunately, due to the privacy and legal terms, we can not find an official publication which is completely directed against the BI implementing condition in SMRE in China. However, we can still derive some valuable information from the limited publications and try to give a relatively objective estimation on the future developing trend of BI in SMRE in China.

If we take an overview of the retail industry in China, according to the data released by NBSC (the National Bureau of Statistics of China), In 2017, the scale of the consumer goods market exceeded 30 trillion yuan for the first time, which achieved a steady growth from a large base. Additionally, the total retail sales of consumer goods in the whole year are 30.0931 trillion yuan, which is 10.7% higher than that of the previous year. From the perspective of the whole year, the overall condition of the consumer market in China is in a small ascending trend. With the gradual recovery of the consumer confidence index, the consumer market shows a rational return and the normal consumer demand is gradually released compared to the same term of 2016. Since the second half of 2017, consumption has maintained a rising trend. In general, the trend of Chinese retail industry is still in a steady and positive developing trend.

For the BI implementing condition, according to “the Big Data and BI Industry Analysis Report of China of 2017”, due to the fact that the pressure and difficulty of making profits are increasing, more and more enterprises have applied BI to their daily operations. 40.2 percent of the enterprises that registered in the industrial and commercial bureau have put various BI systems on the line between 2008 and 2015 and these needs are expected to erupt continuously from 2018 to 2022. It is worth noting that, according to the 2017 China Business Intelligence Industry Research report published by iResearch Consulting, it pointed out that even though there is still a big gap with the United States, China has entered the first square array of business intelligence and has become one of the fastest-growing countries on the BI usage. Therefore, in the future, big data BI industry in China will show an acceleration growth in general and the market capacity will continue to be expanded. Regarding the comparison of traditional BI and new self-service BI in the domestic market, in 2017, about 50.2% of enterprises still use the traditional BI, which provides the most typical functions of which is the general daily, monthly reports and other summary analysis reports. About 49.8% of the enterprises use the new self-service BI through which can solve the enterprise comprehensive data display and analysis demand. About 18% of enterprises have introduced new self-service BI, partly or wholly replacing the traditional BI. Although the traditional BI has its own advantages and application scenarios, with the continuous development of the new self-service BI, the traditional BI will gradually withdraw from the historical stage, which is also a positive signal for the developing of new self-service BI systems.

In sum, the developing momentum of Chinese retail industry and business intelligence are both in a positive and swift tendency. As the main force of Chinese retail enterprises, we have enough reasons to believe that the small and medium-sized retail enterprises have even greater potential and space for their future development. In pace with the strengthening of consciousness on BI usage and technology development, the implementation of BI is the irresistible trend among the SMRE in China. In this case, if a BI system can not only meet the demand and requirements of SMRE but also have a relative low rental price which can dispel the misgivings on return of investment, I am very confident about the future of this product.

4.5 Research Result Summary

Based on the research we conducted in this chapter, the results of the test can be seen in table 4-35.

	Hypothesis	Test Result
H1	At present, the popularity of BI in SMRE is lower than that in BRE	Approved
H2	The consciousness of the necessity of marketing means in SMRE is weaker than that of BRE	Rejected
H3	The situation of applying marketing-mix strategies in SMRE is weaker than that of BRE	Rejected
H4	The BI implementing rate of SMRE startups is lower than that of SMRE in other LCP.	Rejected
H5	The SMRE that using BI are those who pay attention to marketing-mix stratgies and promotion activities	Approved
H6	There is significant difference between different types of retail on BI usage.	Rejected
H7	SAP is the most frequently using BI system among the SMRE	Approved
H8	For SMRE that have not yet implemented BI, most of them have the plan to launch BI within 3 years.	Rejected
H9	For SMRE that implemented BI, the most satisfying BI function is the “Interactive Visualization”	Approved
H10	For SMRE that implemented BI, the most unsatisfying BI function is the “Mobile Version”	Rejected
H11	The core competence of SMRE is the low price	Approved in SRE Rejected in MRE
H12	The trend of SMRE is centralization and e-commerce	Approved
H13	BI can help SMRE applying their marketing-mix strategies and promotion means significantly in the operation.	Rejected
H14	The SMRE do not have the consciousness of establishing brand image and enterprise culture	Approved in SRE Rejected in MRE

Table 4-35 The summary of hypothesis testing results

According to table 4-35, five of the twelve hypothesis we put forward at the start of this research are approved and two hypotheses are approved in SRE but rejected in MRE.

Thereupon, we can draw a conclusion that the idea of building a SaaS BI system for the SMRE in China is achievable and with great marketing opportunity.

V. SaaS BI System Design

Based on the results from the research results of chapter 3, combined with the current situation of small and medium retail enterprises and the future development trend, we analyze the user requirements and introduce the system design of the whole SaaS BI in this chapter.

5.1 Requirement Analysis

The first step in the implementation of any system is requirement analysis. Due to the compatibility characteristics of this BI system, it is necessary to investigate the requirements of SMRE in China and find out their commonalities. According to the information that we derived from the interview and questionnaires in Chapter 4, we reached the following requirements.

5.1.1 Functional Requirements

In this session, we will introduce the users' functional demand of the system by extending a business process modeling diagram namely UML use case diagram (Grady Booch, Ivar Jacobson, James Rumbaugh, 1995).
In order to display users' functional requirements more intuitively, we use UML to display them. Figure 5-1 and 5-2 shows the Use Case Diagram of the system administrator and system users.

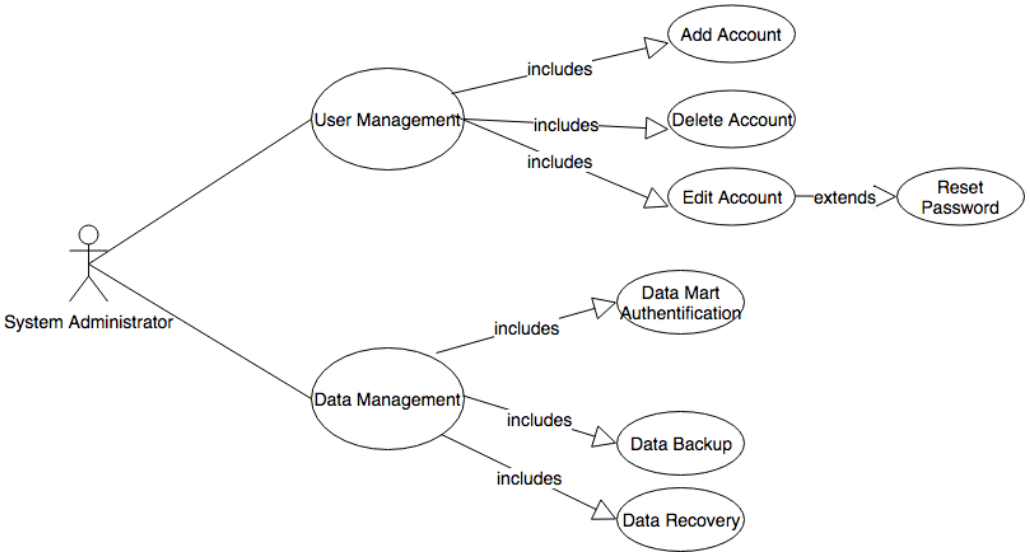


Figure 5-1 Use Case diagram of system administrator

Figure 5-2 Use Case diagram of system user

In this section, we have divided the functional demand into two classifications, which is system administers and system users functional demand. For system administers, they need to manage the accounts of the clients, including the operations like deleting accounts and reset password, at the same time, they also need to supervise the data that stored in the database to ensure the access of the data and the security of the system. For system users, they need to get access to the ETL process and also gain enough information from the report and visualization. The analysis of functional requirements laid the foundation for the whole system.

5.1.2 Non-functional Requirements

Besides the functional demand, nonfunctional requirements like security, privacy and user-friendly usabilities etc are generated in this section, which can be seen as following.

1. From the research we conducted in the previous chapter we can know that in many medium-sized retail enterprises, normally there are multiple departments and branches involved in the operation and decision-making process. However, the database that they use are independent and non-interoperable. Therefore, the geographical dispersion and the heterogeneity of the data require that the application should have high compatibility with the heterogeneous database in the process of data extraction.
2. Because of the competitive relationship between SMRE, the clients are very worried about the leakage of data information. Therefore, it is very crucial and necessary to ensure that each client should have its own independent data cube and the authentication of access should be encrypted.
3. According to the demand from the clients, the final presentation of the report should be intuitive and simple to reflect information. Therefore, different report forms, the

theme of the BI system should be prominent and can be analyzed intuitively and from different angles.

4. Due to the rapid changes in the retail industry, the system needs to be able to reflect the changes in the business in a timely manner in order to obtain useful information for decision making as soon as possible.
5. The function of making a report run according to schedule, such as customizing a report to execute regularly every day
6. Since the data are provided on a daily or weekly basis, the customer expects these new figures to be reflected in the report as soon as possible, on a daily basis or weekly basis.

The analysis of non-functional requirements has provided a guarantee for the data security, data interaction, and better user experience on the basis of the integrity of the system.

3.2 System Design

This section has introduced the specific design of the entire SaaS BI system, including the overall framework, the system security design, the design of the report display, the design of the ETL and the OLAP, and the compatibility of the multi-user design.

3.2.1 General Framework

The general framework of the system design can be shown in figure 5-3. The whole architecture of the system is divided into four layers: data source layer, data warehouse layer, application service layer and end-end user layer. This architecture is the basic framework of the business intelligence system, but the system adds a temporary server between the data warehouse layer and the application service layer, although it increases the cost, but the efficiency has been greatly improved.

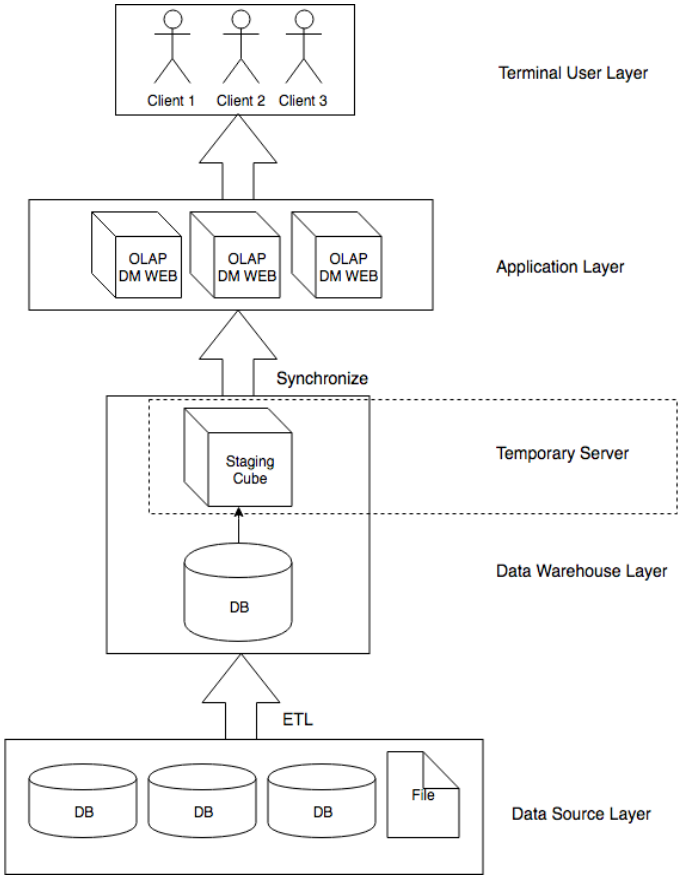


Figure 5-3 general framework of the designed SaaS BI system

1.Data Source Layer

Due to the fact that the SaaS BI system is geared to the needs of various clients from retail industry and they all have many subsystems, which leads to the different format of the data source. It may be text data, or database, SQL Server, DB2, ORACLE, and even the data on the network. he data from these data sources are imported completely into the ORACLE without any data manipulation. Thus, the data in the data source layer are the actual sales of enterprises, inventory and other data, including historical data and daily new data. Also the CSV files, including initialized user rights, customer information, vendor list, retailer list and other relevant documents.

In order to have a better observation, we adopt a vertical table in Oracle and horizontal tables are used in SQL Server of data warehouse layer to facilitate query and analysis. We use ETL to import data from ORACLE into SQL Server, which can convert a vertical table to a horizontal table, that is the rotating process of the data. The ideal format of horizontal table and vertical table can be seen in Table 5-1

Store ID	Area	Sales
001	Beijing	€8,000
002	Shanghai	€8,200
003	Hongkong	€10,000

Table 5-1 Horizental Table

Store ID	Field Name	Field Value
001	Area	Beijing
001	Sales	€8,000

002	Area	Shanghai
002	Sales	€8,200
003	Area	Hongkong
003	Sales	€10,000

Table 5-2 Vertical Table

2.Data Warehouse Layer

When the data in the Oracle database is processed by ETL, it will be imported into the SQL Server database, which contains the fact data and the dimensions, layers and attributes information within the multi-dimensional cube. And then, after the processing of SSIS (SQL Server Integration Services), we can get a Staging Cube which is a temporary server for storing data.

It is worth noting that we have added a staging cube here. Instead of being used directly by customers, it is intended to prepare the real dataset for Live Cube. As the data need, be updated daily or weekly, the structure of the multi-dimensional cube could be altered more or less. If it is updated directly on Live Cube, it will greatly affect server performance during processing, which will affect the performance of the report generated by the customer. Thus, adding a staging cube could eliminate these problems, even though it will add a certain amount of cost.

3.Application Layer

After processing the update operation of the staging cube, the next step is to copy Staging Cube via SSIS from the temp server to the product server as a real data set, which is known as Live Cube.

3.2.2 System login security design

Because the system integrates the business of multiple clients, many clients can query the report form by extracting data from different cube. In this case, while many customers have business competitive relationships, security issues are their most concern when we investigate the needs and demands during the research. To solve this problem, the flowchart of logging in to the Web application can be sketched as following,

1. The user enters the user name and password through the login interface of the Web application
2. A request is sent to Portal Server, and ADFS Web Agent truncates the request and determines whether the user has a Cookie authorized by ADFS, which is redirected to ADFS Proxy without the user.
3. User sends Http request to ADFS proxy to apply for login qualification
4. Certification will be accepted and sent to ADFS Server
5. ADFS Server will go to AD to request authentication for the user
6. The AD authenticated user and ADFS Server retrieve the user's attributes and establish the security tag and the ADFS authorization tag.
7. Authorization information and other information will be sent to client via ADFS Proxy
8. The ADFS Web Agent receives and verifies this tag, and if the verification is successful, it will generate another ADFS authentication tag and sends a request to the Web application to log in successfully.

Through this login mode, even if someone copies the URL connection in midway and reopen the browser, trying to bypass the login operation and enter the system directly, it still need to log in again before entering the corresponding page.

3.2.3 Report Display Design

As end users, our clients do not have to care about the framework or security issues of the system, the demonstration of our system is just how we can present the data, that is the display of reports. Reports can be presented to customers in the form of data, lists, graphics, and curves, which are the most intuitive and refined manner of displaying the figures.
The flow chart of establishing the report can be seen in Figure 5-2

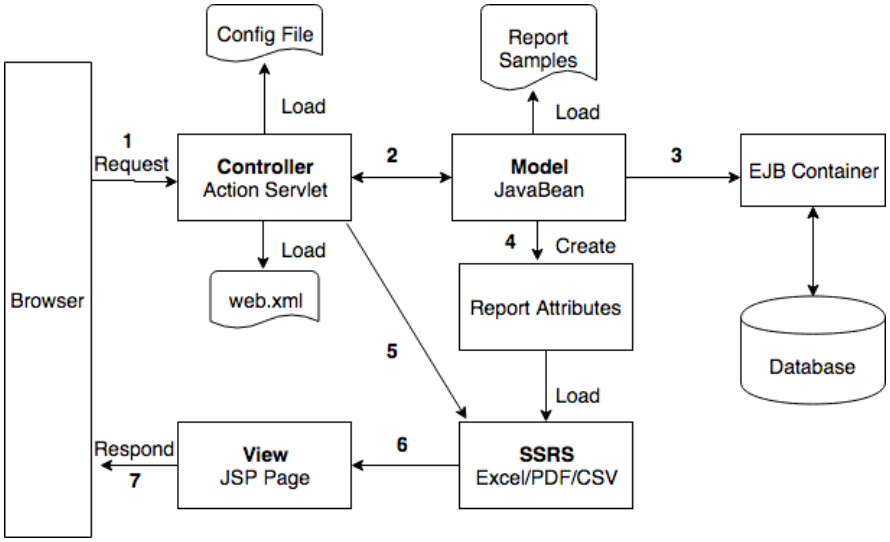


Figure 5-2 The flow chart of creating report

We provide several types of reports based on client needs, which can be seen as follows,

1) Standard reports: a set of pre-configured report templates with built-in options and layout parameters. We propose seven types for this purpose as following,
    a) Sales and Inventory Review: In addition to supply-side measures, consumer demand indicators are provided to users in the form of POS data, such as on-hand inventory, supply turnaround and supply days, etc.
    b) Promotion Analysis: The report evaluates sales by using baseline analysis to compare actual sales (total sales and sales sales).
    c) Rolling Period: The report provides a performance snapshot of key metrics compared with the previous year for a rolling cycle.
    d) Stores Not Scanning: This report provides the user with a list of valid stores that do not have any POS sales data for a given project indicator and within a given period. It also provides a separate page listing of stores with sales data.
    e) Ranking: The report allows users to order different categories, brand sales or inventory of goods.
    f) New Item Launch Tracking: The report provides an overview of the progress and details of rolling out new projects by selecting product dimensions and geographic dimensions.
    g) Inventory Trend: The report provides the ratio of inventory stock to goods on sale in a given period

3.2.4 ETL design

Generally speaking, the process of ETL is to sort the data sources which are in random, irregular, in different formats into integrity and consistency through filtering, deleting, conversion format and other methods so as to facilitate subsequent data analysis

afterwards. Due to space constraints and the orientation of this article, we will not deep down further here. Instead, we will focus on the schemes and ideas on the design process of ETL. Hereby, we analysed several possible options as follows:

- Plan A (can be shown in Figure 5-3): Creating OLAP Cube directly on Oracle Database

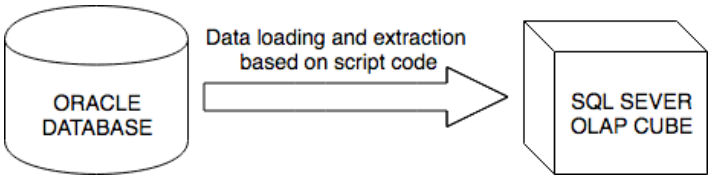


Figure 5-3 ETL Plan A

Through SLR, we find that although this plan is easy to implement, however, it is not possible to implement such an ETL process in the actual development process. The reasons can be explained as follows,

1. Because of the daily POS data stores in the Oracle database, the amount of data is huge and irregular. Under this influence, during the data loading process, there might be potential performance problems on servers. Due to the fact that the OLAP cubes of several clients may exist on the same server, so when one of the cubes is on processing, the server resources will be taken up a lot, thus affecting the use of other clients.
2. the server in the Oracle database is not just doing the data processing to the temporary data set. It has to record new data every day. In this way, some performance problems might happen in the Oracle database, such as the processing process and the coexistence on other job.
3. Integration and driver problem of Oracle and SQL Server

Considering the infeasibility of the scheme A, we choose the scheme B as the final ETL implementation plan, which is to create a temporary cube for storing the data.

- Plan B (can be shown in Figure 5-4): Creating a temorary cube

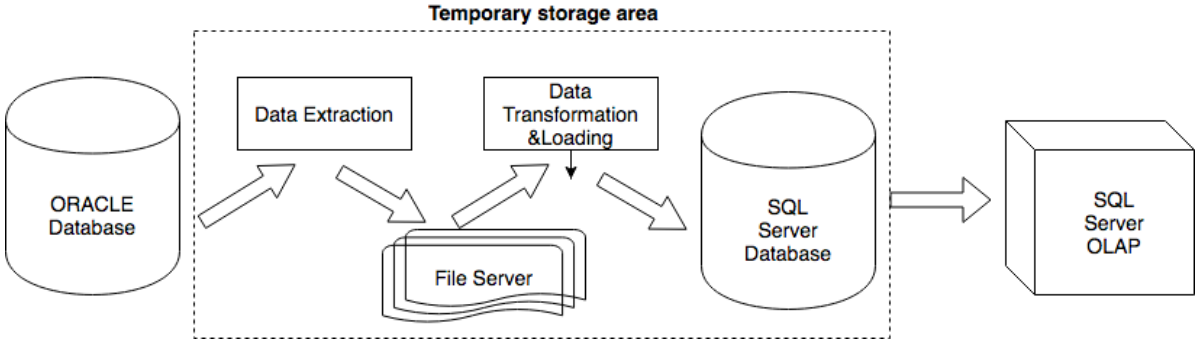


Figure 5-4 ETL Plan B

In this scheme, a temporary area of data stored for Cube is added. This temporary storage area is placed in the SQL Server database. Oracle extracts data and transforms them into the files with the format we already known. Then SQL Server uses SSIS package to transfer data from these files to the temporary storage area, which is SQL Server database. Finally, according to the needs of Cube, data is processed from SQL Server database to Cube. In these independent systems, each system can solve its own performance and data loading problems on its own. At the same time, the interface between Oracle and SQL Server has also been solved with files.

3.2.5 Design of data warehouse and OLAP

The most important and most difficult part of business intelligence system is the design of data warehouse and OLAP, which is related to whether the software service we provide is efficient and accurate. The basic process of data warehouse module is transforming relational database (2D database) into a multidimensional database (Cube) through a certain operation, which includes two parts: the design of relational database and the design of multidimensional database.

- The construction of data model

Since the Cube used in practical applications is changed from the Spoke two-dimensional database, we analyze the structure of the tables in the Spoke database. According to the different functions, we divide the tables into the following categories.

1. Configuration Table

This table is mainly used to configure the basic information of Cube and database, to get the latest property value when installing and updating Cube, and to configure the properties dynamically. For example, the latch file of the database, the storage path of the file, the name and address of the connected Hub, and the name of supplier, retailer, etc.

2. Dimension Table

Since the two-dimensional database is the basis of Cube, it is necessary to define the information related to dimension in Cube, which including: date dimension table, product dimension table, geographical dimension table, supplier dimension table, retailer dimension table, distribution center dimension table etc. Because the annual reporting time of each customer company is different, different calendar attributes need to be created for different customers. At the same time, even in the same company, for different projects, the start time of the annual report will be different. Therefore, there may be multiple Calendar information for the same customer and we need to set special attributes such as the start month in the calendar in the table. The cube is based on the combination of Supplier and Retailer, so the basic information of supplier and retailer is stored in the supplier dimension table and retailer dimension table.

The product dimension table: It includes the attributes such as Supplier_key, Retailer_key, Item_key, Brand, UPC, Item_Description, etc. Their values are specific to a group of Supplier and Retailer.

The geographical dimension table: It includes the attributes such asSupplier_key, Retailer_key, Store_id, City, State, ZipCode, etc. These attributes demonstrate that the retailer sells the product in which state, which city, which store. Their values are also specific to a group of Supplier and Retailer.

The distribution center dimension table: It includes the attributes such as DC_key, DC_Name, Store_key, Store_ID, etc, which are used to obtain the inventory information of distribution center and to reflect the sale of a commodity after the delivery at these distribution center.

3. Fact Table

Sales fact table: It stores the POS data from the Oracle database, which including sales, sales, promotions, promotions, normal sales, normal sales, inventory, inventory order, distribution center inventory, etc. Therefore, the attributes in this table are asSupplier_key, Retailer_key, Period_key, Item_key, Store_key, Promotion_Sales, Promotion_Units, Regular_Salse, Regular_Units, Store_On_Hand, Store_Order, etc.

Plan fact table: It is used to record the expected sales information of a commodity and to compare the gap between the actual sales data and the actual sales data to analyze the

advantages and disadvantages of the form of sales, the means of sales, and the sales situation in different regions, etc.

4. Metadata Table

Calendar metadata table: It holds the Calendar information that is unique to the Spoke. Its data is derived from the calendar dimension information table, customizing the annual starting month of the Calendar, and the starting date of the weekly, according to the calculation method of the annual report of the customer's company. Each Spoke can have multiple calendars, and sales information can also be different depending on the Calendar.
Attribute metadata table: It is used to store information about product dimension, regional dimension and distribution center dimension. Attribute information contained in each dimension, such as the product dimension. It contains the attributes Supplier_key, Retailer_key, Diraension_Type, Attribute_Name, which are the basis for the final analysis of the data.
Metric metadata table: It is used to store the key metrics, such as Total_Sales, Total_Units, Promotion_Sales, etc.

5. OLAP Table

Aggregation table: Because the amount of data in Cube is generally large, when customizing the report, it may take a long time to run, which will affect the efficiency. Thus, we need to add some of the common attributes to the Aggregation Group of Cube so that customers can greatly reduce the time of report query.
Hierarchy table: It is used to store the structural relationship between multiple dimensions. For example, the structural relationship of “Calendar” is Year-Quarter-Month-Week-Day.
Metric table: In addition to the core metrics defined in the metric metadata table, we need a lot of computing metrics based on these core metrics. In this table, all metrics used in all Spoke will be stored, such as Metrics_Name, Folder, Description, Data_Type, etc.

6. Transfer Table

Transfer tables are used to manage the state of data transmission from Oracle terminals, check data validity, etc. Due to the fact that there are a lot of new data that need to be added to the data warehouse every day. At the same time, historical data sometimes need to be updated. Therefore, we need a table which can show the state of the data transmission is already been transferred or not. If Oracle sends a transfer key, that means the data needs to be transmitted according to the date meter. If the data is already been transmitted, it will be marked as “Needed”, otherwise it will be marked as “Not Needed”. If the transmitted data contains abnormal data (empty key value, duplicate data), then it is labeled Error, and it will not be transmitted. After the 2D database modeling is completed, the data will be imported. Then the customers can query and analyze the data they they need based on this traditional database

However, considering about the big amount data of SMRE and the complex relation between attributes, if we use traditional SQL statement to execute queries, the complexity and execution time of SQL statements may become a serious bottleneck of the system.
Since the two-dimensional database can not meet our needs, we need to find a new solution. In this case, multidimensional database (Cube) can help us to solve this problem, which will be introduced in the following session.

- The design of multi-dimensional cube

The creation of a multidimensional database is a simple process, which is based on a two-dimensional database and basically includes the elements for creating Cube: Dimension, Hierarchy, Metrics, and Data. In a Cube, in addition to the core metrics defined in a two-dimensional database table, many of the metrics that are calculated through the Core Metrics are required because of the customer's requirements. Generally speaking, Core Metrics is calculated by a certain aggregation algorithm, such as the sum, the average, the maximum value, the minimum value and so on. The calculation formula is also relatively simple. However, some formulas are more complicated, or it involves many other metrics. Therefore, in order to get it, we need to calculate all the metrics involved in the query process. To solve this problem, in the process of the two-dimensional cube, we prepared some calculation formula of some metrics which are commonly used by the customers and put it into the cube. So, every time the customer goes to the query, they do not need to get the data back through the complex calculation but take the data directly from the cube. Also, because of the characteristics of the SMRE, the amount of data is huge and increasing every day, which leads to that it will take a very long time to query based on the data sliced from different dimensions. In cube, there is a mechanism which defines some aggregation in this Cube in advance (as in Figure 4-4), which is mainly to select a number of attribute values on different dimensions, such as selecting the name of the product in the product dimension, selecting the store name on the geographical dimension, and adding the attributes of the calendar dimension, which constitutes a aggregation. If the customer selects the name of the product, the name of the store, the specified date range as the condition of the custom report, then the inquiry time will be completed within l-2s.

3.2.6 Multi-client compatible design

Because of the different needs of different customers, there is basically no software on the market to meet the needs of the customers at the same time. If there is a system that meets the needs of many customers, sharing all the development costs among customers will save them a lot of money over the cost of their own development. Therefore, the SaaS BI system that we're developing is coming to meet with this kind of commercial opportunity. Our product is not only a software, but also a service. In view of the characteristics of the retail industry, although the needs of retail customers are not the same in certain details, for example, the term "attribute" for a certain dimension is inconsistent, Either the demand in the product dimension is not the same, the customer needs the attribute M, and the B customer needs the attribute N, or some customers do not need a specific dimension at all. However, after we analyzing the needs and demands from different customers, we found that it is possible to design a multi-compatible BI system which can meet most customers' requirements.

1. Data Warehouse and the Establishment of Cube

As we can see in Figure 2-5, A Hub may connect with multiple Spoke and the Spoke here can be regarded as a customer group. Each customer group we defined is distinguished by a combination of vendor supplier and retailer retailer, which allows the same supplier to combine with multiple retailers, thus can forming multiple Spoke. Conversely, a retailer can also combine with multiple suppliers. For example, Supplier1_Retailer 1, Suplier1_Retailer2, Supplier2_Retailer2, which can formates three different combination between suppliers and retailers. For the retailer and supplier do not have a business relationship between each other, like Supplier2 and Retailer 1, or even if it exists in a certain business relationship, but they do not need to analyze the combination of their data, we do

not need to create a data warehouse for them. The creation process for each Spoke is similar, except that the contents of their respective configuration files are different.
Firstly, two different types of spoke is applied in the design process, which is SVR silo and MVR silo. The so-called SVR Silo is the abbreviation of “Single Vendor Retailer”, which means that Supplier and Retailer are one-to-one. Similarly, the MVR is the abbreviation of “Multiple Vender Retailer”, which means that one supplier can have business with multiple retailers and vice versa. SVR Silo can be connected to MVR Silo on the same HUB and it doesn't interact with each other. Only because the customer needs different, they will have some differences in the background business processing. But the user experience of these two silos is exactly the same at the front desk

2. Event notification mechanism

After the Spoke installation or upgrade is complete, until the next upgrade, there is an import of new data. Upgrading Spoke directly will certainly meet the requirements, but during this upgrade, customers will not be able to use the Service because it needs to be stopped, and problems such as new data occur every day, so a direct upgrade of Spoke would be a challenge to customer patience. At the same time, since our system is compatible with multiple customer companies, how can we move on to the appropriate Spoke without affecting the use of other Spoke, or do different operations on different Spoke, such as importing new data on Spoke 1, Security settings on Spoke 2 and Cube Process on Spoke 3. If something goes wrong, it will affect the use of at least two client companies. Therefore, we need to find a more reasonable solution. Because all changes are reflected on spoke, whether it is data attribute name or cube structure, there is no Spoke with the same name on a hub. So, we take an event notification mechanism, as shown in Figure 5-5

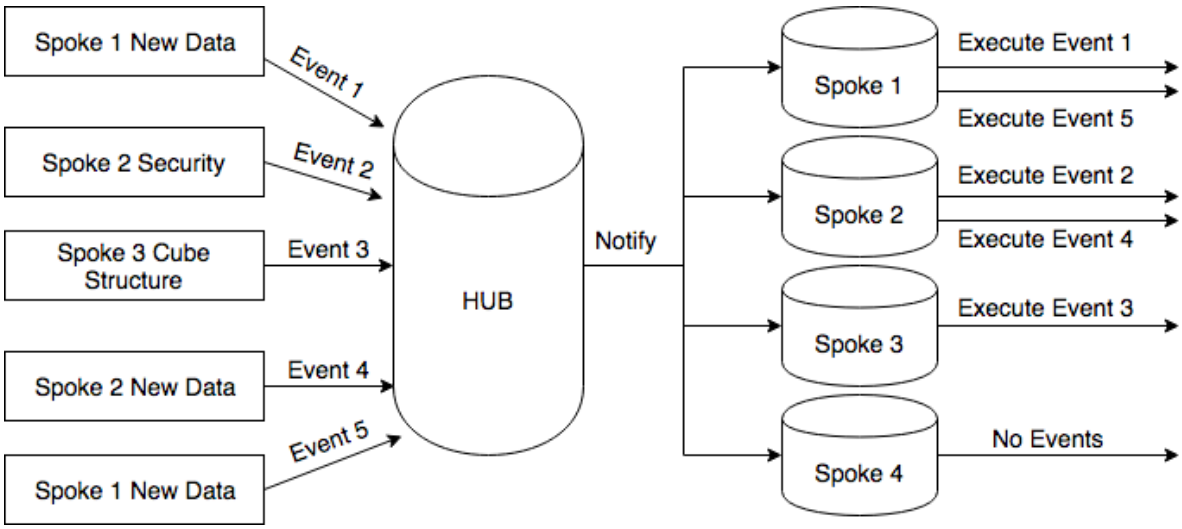


Figure 5-5 Schematic diagram of event notification mechanism

Occurrence of events: All Spoke actions will generate the events and write to Hub's database table correspondingly. A record is an event. This table has two key fields: SpokeID and EventType. SpokeID is used to distinguish the event occurs in which spoke, and the EventType is used to record the types of events, such as ETL, Security attribute Mapping Change, etc. For example, In the case of ETL, when a HUB checks that a Spoke has new data to import, an Event will be generated on the Oracle side to the Hub.

Notification of events: There is a Job on Hub, which is designed to run every 2 minutes automatically. It will notify all events on the Spoke to the correspond Spoke according to SpokeID. According to different EventType, the writing to Spoke database tables is also different. For example, there are multiple events in the ETL. When the Spoke is notified, the data will be written into the Spoke table one by one according to the records in the Hub database table.

And for the events like Cube Process, even if there are many events waiting for operation, it only need to be executed once, which means only one event will be written to the Spoke database table.

Execution of events: Regarding the execution of the events, the logic of different Spoke execution events is almost the same. There are no interconnections between Spoke and all of them operate on their respective databases and Cube. Similarly, as the notification of events, the Spoke also has a job which runs every two minutes. According to the order of the event, the state of an event with a state of “N” will become “Y” after execution. When these actions are completed, we can see the changes brought by this event on Spoke.

VI. Conclusion

Generally speaking, the actual implementation of BI and the awareness of marketing-mean applications in SMRE of China is much positive than my envision.

Specifically, from the results of the hypothesis testing we can draw a conclusion that although the popularity of BI in SMRE is still in a relative low level, the implementation of BI is becoming popular increasingly among the relative medium sized retail enterprises. By comparison, the BI application situation of small retail enterprises is still not optimistic. For the marketing level testing, the current situation of medium-sized retail enterprises and small retail enterprises is also quite different. Many medium-sized retail enterprises have already formed a certain organizational culture, and have attached great importance to their brand and the reputation of the market, and take high quality products and services as the guidance to improve their core competence in the market by using all kinds of marketing means and strategies to expand their influence for their products, which means that China's medium-sized retail enterprises are gradually becoming regularized and marketed, and with the help of BI, they can make more targeted strategies and rational decisions. The space for development is still very large. For small retail enterprises, they are still lacking in the sense of organizational culture and brand awareness, and they do not pay much attention to the means of marketing and the use of BI. In a word, they are still in a traditional "I shop, you buy" sales state.

Because of financial constraints, although many SMRE are fully aware of the importance of marketing analysis and the benefits that BI can bring to them, very few small retail businesses are willing to spend a lot of money on BI applications. To some extent, it is a paradoxical phenomenon since they all know BI is a effective tool to analyze the data thereupon then can help retail enterprises have a rational marketing-mix strategies, but they still did not implement BI in their business and even refuse to launch it within 3 years.

In this case, due to the fact that SMRE does not require as much function richness and depth as large enterprises, if there is a BI system that can not only meets SMRE's functional capabilities but also costs less, I believe its market foreground will be very bright and promising. Thereupon, I am very confident about the marketing prospectus of the SaaS BI system that I want to start an undertaking.

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Appendix A Questionnaire Sample

The survey of the implementation situation of business intelligence in retail enterprises
Dear Sir / Madam,
This survey is aiming to investigate the implementing situation of BI system in small and medium retail enterprises. The result of this survey will be only used for my personal academic research.
By filling out this 5-10-minute survey, you will help us obtain the very best results.
Note: Marking " √ " or fill in the line directly behind the matching option. Thank you very much!

I. Basic Information

1. What is the scale of the retail enterprise you work for?

❑ Relative Large
❑ Relative Medium
❑ Relative Small

2. Which is the life cycle period of the retail enterprise you work for?

❑ Start-up (1-2 Years)
❑ Toddler Stage (3-5 Years)
❑ Adolescence Stage (6-10 Years)
❑ Maturation Stage (More than 10 Years)

3. Which is the type of the retail enterprise you work for?

❑ Food & Beverage
❑ Supermarket/Hypermarket
❑ Clothing & Bags & Shoes
❑ Health
❑ Luxury
❑ E-Commerce
❑ Convenient Store
❑ Electronic products
❑ Manufacturing products
❑ Furniture & Decorations
❑ Toy & Entertainment
❑ Others_____

4. What is your role in your organization?

❑ General Employee
❑ First-Line Manager
❑ Mid-Line Manager
❑ Top Manager

II. The Investigation of the Marketing Awareness

5. Do you think it is necessary to use marketing in the operation of small and medium retail enterprise?

❑ Very Necessary
❑ Necessary
❑ Not Necessary
❑ Hard to Say

6. What is the applying situation of marketing strategies in the retail enterprise you work for?

❑ Widely Use
❑ Normally Use
❑ Seldom Use
❑ Never Use
❑ I Don't Know

7. Please make an evaluation of the statement below how it matches the business situation of the retail enterprise you work for according to your personal feelings

Statement	**To what extent do you agree**
Be familiar with the merchandise and know well of the sales, inventory, promotion, employee KPI etc.	❑ Totally Agree ❑ Agree ❑ Neutral ❑ Disagree ❑ Totally Disagree
Pay attention to the use of various means of promotion in order to improve the sales of goods.	❑ Totally Agree ❑ Agree ❑ Neutral ❑ Disagree ❑ Totally Disagree
Pay attention to the sales data analysis, adjust commodity category, commercial product structure and display mode in time according to customer demand	❑ Totally Agree ❑ Agree ❑ Neutral ❑ Disagree ❑ Totally Disagree

III. The Investigation of the Implementing Situation of Business Intelligence

8. Does your company use Business Intelligence system to support your business?(If No, please jump to Q11)

❑ Yes
❑ No
❑ I don't know

9. As far as you know, which BI system do you use in your company?

❑ SAP BO
❑ IBM Cognos
❑ QlikView
❑ Microsoft SQL Server
❑ Oracle BI EE
❑ Tableau
❑ SAS
❑ Salesforce
❑ ClearStory Data
❑ TIBCO
❑ Zoomdata
❑ Alteryx
❑ Birst
❑ Domo
❑ Yellowfin
❑ Logi Analytics

❑ Datameer
❑ FineBI
❑ Others_____

10. When did your company start implementing the BI system?

❑ 2012~2017
❑ 2006~2011
❑ Before 2006
❑ I don't know

11. What is the approximate cost of developing/purchasing the BI system?

❑ Below 100,000 EUR
❑ 100,001~200.000 EUR
❑ 200,001~300,000 EUR
❑ 300,001~500,000 EUR
❑ Above 500,001 EUR
❑ I don't know
❑ Other (e.g: 5,000EUR/year) _____

12. Who are the end users of the BI system in your company?

❑ IT personnel
❑ General personnel
❑ Junior Analyst
❑ Mid- Management
❑ Managers
❑ CIO
❑ Others_____
❑ I don't know

13. Does the effect of the BI system reach your expectation?

❑ Yes
❑ No
❑ Hard to say

14. Which function in the BI system you are most satisfied during your using?

❑ Cloud BI
❑ Self-service Metadata Management
❑ User-defined ETL & Data Storage
❑ Aggregation Packages
❑ Analysis Panel
❑ Interactive Visualization
❑ Automatic Searching
❑ Mobile Version
❑ Self-service Data Preparation
❑ Others_____

15. Which function you are least satisfied during your using(Skip to Q18)?

❑ Cloud BI
❑ Self-service Metadata Management
❑ User-defined ETL & Data Storage
❑ Aggregation Packages
❑ Analysis Panel
❑ Interactive Visualization
❑ Automatic Searching

- ❑ Mobile Version
- ❑ Self-service Data Preparation
- ❑ Others_____

16. What prevent you from implementing a BI system in your company?

- ❑ Lack of funds to develop/purchase
- ❑ Not really need it
- ❑ Have a doubt that if it is worth to invest
- ❑ We have other ways to analyze our data
- ❑ Others_____
- ❑ Hard to say

17. As far as you know, do you have the plan to implement a BI system recently?

- ❑ Yes
- ❑ No
- ❑ I don't know

18. If we provide a BI system based on web which has relatively low charges, will you consider to use it?

- ❑ Yes
- ❑ No. Reason_____
- ❑ Hard to say

Thank you for your participation!

Appendix B Anonymized Survey Results

#	Q1	Q2	Q3	Q4	Q5	Q6	Q7_1	Q7_2	Q7_3	Q8	Q9_1	Q9_2	Q9_3	Q9_4	Q9_5	Q9_6	Q9_7	Q9_8	Q9_9
1	1	4	1	1	4	1	2	1	1	1	1	0	0	0	0	0	0	1	0
2	2	1	6	1	1	1	3	2	2	2	0	0	0	0	1	0	1	0	0
3	2	2	10	2	1	2	1	1	1	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
4	2	1	5	1	4	3	3	3	2	2	0	1	0	0	1	0	0	0	0
5	2	3	3	4	2	3	3	3	3	1	0	0	0	0	0	0	0	0	0
6	3	2	1	1	2	1	1	2	1	1	1	0	0	0	0	0	0	0	0
7	3	1	1	1	1	1	2	2	3	2	1	0	1	1	0	0	0	0	0
8	1	4	12	2	1	2	2	2	4	3	-3	-3	-3	-3	-3	-3	-3	-3	-3
9	2	3	2	3	3	2	2	3	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
10	2	4	9	1	2	2	1	2	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
11	3	1	3	1	1	2	3	2	4	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
12	1	4	4	1	1	1	4	4	4	1	1	0	0	0	0	0	0	0	0
13	1	2	2	2	2	3	4	4	2	1	0	0	1	0	1	0	1	1	1
14	2	3	4	3	2	3	2	3	3	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
15	3	1	8	1	1	3	3	4	3	3	-3	-3	-3	-3	-3	-3	-3	-3	-3
16	1	1	1	1	1	1	3	4	4	1	1	0	0	0	0	0	0	0	0
17	2	3	12	1	1	2	1	1	1	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
18	3	3	4	1	2	3	2	3	2	3	-3	-3	-3	-3	-3	-3	-3	-3	-3
19	2	4	12	1	1	2	2	2	2	1	0	0	0	0	1	0	0	1	0
20	2	2	11	1	1	2	2	2	3	1	0	1	0	0	0	0	0	0	0
21	2	1	12	1	1	5	3	2	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
22	2	1	8	1	2	2	3	3	4	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
23	1	2	2	3	2	2	2	2	2	1	0	1	0	0	1	0	0	0	0
24	1	4	2	1	1	2	3	2	1	1	0	1	0	1	0	0	0	0	0
25	2	3	6	4	1	2	3	1	1	1	1	0	0	1	0	0	1	0	0
26	1	4	12	1	1	5	2	4	2	1	1	0	0	1	0	0	1	0	0
27	1	1	4	1	2	2	2	2	2	1	0	1	0	1	1	0	0	0	0
28	2	2	5	1	2	2	3	2	2	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
29	1	4	5	1	2	3	2	3	3	3	-3	-3	-3	-3	-3	-3	-3	-3	-3
30	3	1	6	1	2	2	2	2	1	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
31	2	1	1	1	2	5	3	3	4	2	-3	-3	-3	-3	-3	-3	-3	-3	-3
32	3	1	1	1	2	5	4	2	4	2	-3	-3	-3	-3	-3	-3	-3	-3	-3

33	2	2	7	2	2	2	2	2	3	1	0	0	0	0	0	0	0	0	0
34	3	2	11	3	1	2	1	2	2	1	0	0	1	0	0	0	0	0	0
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61	0	0	0	0	0	0	0	0	0	0	1	6	1	1	0	0	0	0	0
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4	0	2	1	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0
5	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0
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36	0	1	1	0	0	0	1	1	1	0	0	0	1	0	1	1	0	1	0
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5	0	1	0	-3	-3	1
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7	0	0	0	-3	-3	1
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10	-3	-3	-3	6	2	1
11	-3	-3	-3	1	1	1
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17	-3	-3	-3	1	1	1
18	-3	-3	-3	-3	-3	-3
19	1	0	0	-3	-3	1
20	0	0	0	-3	-3	1
21	-3	-3	-3	-3	-3	-3

22	-3	-3	-3	-3	-3	-3													
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24	0	0	0	-3	-3	1													
25	0	0	0	-3	-3	2													
26	0	0	1	-3	-3	1													
27	0	0	0	-3	-3	1													
28	-3	-3	-3	1	1	1													
29	-3	-3	-3	-3	-3	-3													
30	-3	-3	-3	1	2	1													
31	-3	-3	-3	-3	-3	-3													
32	-3	-3	-3	-3	-3	-3													
33	1	0	0	-3	-3	1													
34	0	1	0	-3	-3	1													
35	-3	-3	-3	1	1	1													
36	0	0	0	-3	-3	1													
37	0	0	0	-3	-3	1													
38	0	0	0	-3	-3	2													
39	-3	-3	-3	-3	-3	-3													
40	-3	-3	-3	-3	-3	-3													
41	1	0	0	-3	-3	3													
42	-3	-3	-3	1	1	1													
43	-3	-3	-3	-3	-3	-3													
44	0	0	0	-3	-3	1													
45	0	0	0	-3	-3	1													
46	1	1	0	-3	-3	1													
47	0	0	0	-3	-3	3													
48	-3	-3	-3	-3	-3	-3													
49	1	0	1	-3	-3	2													
50	-3	-3	-3	-3	-3	-3													
51	0	0	0	-3	-3	1													
52	-3	-3	-3	-3	-3	-3													
53	-3	-3	-3	3	1	1													
54	-3	-3	-3	-3	-3	-3													
55	-3	-3	-3	-3	-3	-3													
56	0	0	1	-3	-3	1													

57	-3	-3	-3	6	2	3													
58	1	0	0	-3	-3	3													
59	0	0	0	-3	-3	3													
60	0	0	0	-3	-3	1													
61	0	0	0	-3	-3	1													

Appendix C Anonymized Interview Results

Interviewee A

Code	**Comment**
#founding_time	the company was founded in 1998
#over_400_employees	number of employees
#retail_category_clothing	the main business is fashion clothing
#location	headquarter in HK, office in Beijing, Shanghai
#younsters_as_target_customer	the target customer of the brand is the trendy younsters
#region_sales_manager	the title of interviewee is the sales manager of Northeast of mainland China
#making_sales_plan	routine responsibility
#recruting_salesman	routine responsibility
#KPI_evaluation	routine responsibility
#training	routine responsibility
#channel_customer_management	routine responsibility
#sales_reporting	routine responsibility
#sales_analysis	routine responsibility
#fashion_as_selling_point	the value proposition is fashion oriented
#high_positioning	the positioning of the brand is relative high
#crossover_as_product_strategy	publish crossover cloth with other major trendy brands
#retro_as_product_strategy	publish retro style cloth with other major trendy brands
#enrich_portoflio_as_product_strategy	enrich portfolio category
#branch_expanding_as_development_strategy	enrich branch distribution in mainland China
#expanding_Europe_market_as_development_strategy	open branch in Europe in 3-5 years

#no_low_end_parity_products	do not consider to develop PoP products
#monthly_quarterly_updating_on_sales_indicators	sales record updating cycle
#outsourcing_marketing_analysis	the marketing analysis (competitors, industry) is outsourced
#monthly_quarterly_market_share_feedback	feed back period
#economic_indicators_feedback	economical indicators feedback, including GDP, CPI inflation, etc
#branch_in_Canada_2016	a branch in Canada was established in 2006
#USP_as_core_competence	uniqure selling produts as their core competence
#service_as_important_competence	provide predominant service to customers
#provide_more_choice	provide more choice for customers
#meet_more_consumers_needs	design more personalized cloths and accessories to meet more customers'need
#enterprise_culture_as_core_brand_positioning	pay attention to cultivate enterprise culture
#energetic_young_as_enterprise_culture	enterprise culture
#break_frame_of_thought	enterprise culture
#capture_prophetic_fashion_tendency	enterprise culture
#brand_impact_as_advantage	competitive advantages
#original_as_advantage	competitive advantages
#collaboration_as_advantage	competitive advantages
#multi-channel_propaganda_as_advantage	competitive advantages
#source_of_good_as_disadvantage	competitive disadvantages
#price_as_disadvantage	competitive disadvantages
#portoflio_structure_as_disadvantage	competitive disadvantages
#data_non- interoperability	BI-related usage deficiency
#database_independent_between_subdiaries	BI-related usage deficiency
#multiple_data_management_software	BI-related usage deficiency
#complicated_summrization	BI-related usage deficiency
#data_redundency	BI-related usage deficiency
#data_updating_lag	BI-related usage deficiency
#lack_of_prediction_function	BI-related usage deficiency
#hard_to_integrate_data_from_multiple_data_source	BI-related usage deficiency
#dashboard	BI-related usage highlight
#report_forms	BI-related usage highlight
#OLAP_inquiry	BI-related usage highlight

Interviewee B

Code	Comment
#neiborhood_supermarket	supermarket near communities
#founding_time	the supermarket was founded in 2009
#title_sponsorship_by_a_major_brand	the supermarket received a tilte sponsorship by a major brand supermarket
#regular_submission_of_sales_data	submit sales data to the sponsor periodically
#independent_operation	the operation of the supermarket is still self-operated
#21_employees	21 employees in total
#arrange_purchase	routine responsibility
#arrange_replenishment	routine responsibility
#check_inventory	routine responsibility
#accounting	routine responsibility
#serving_surranding_community_residents	value proposition
#provde_wealth_of_products	value proposition
#fresh_agricultural_by-products	value proposition
#low_price	value proposition
#everyday_low_price	promotion means
#buy_one_get_one_for_free	promotion means
#business_with_small_capital	positioning
#daily_necessities_outermost_side	commodity display rules
#fresh_food_intermost_side	commodity display rules
#variable_color_label_for_products	commodity display rules
#promotion_poster	in-shop marketing
#commodity_regional_distribution_sign	in-shop marketing
#easy_distinguish_as_principle	in-shop marketing principle
#easy_reaching_as_principle	in-shop marketing principle
#first_come_first_go_as_principle	in-shop marketing principle
#products_relevance_as_principle	in-shop marketing principle
#high_profit_priority_as_principle	in-shop marketing principle
#low_price_advantage	competitive advantages
#good_location_advantage	competitive advantages
#supplier_stability_advantage	competitive advantages

#major_brand_sponsorship_advantage	competitive advantages
#mobile_payment_advantage	competitive advantages
#limited_residents_consumption_ability_disadvantage	competitive disadvantages
#low_education_level_of_employee_disadvantage	competitive disadvantages
#vegetable_market_surrounded_disadvantage	competitive disadvantages
#major_supermarket_surrounded_disadvantage	competitive disadvantages
#low_level_customer_service_disadvantage	competitive disadvantages
#weak_on_sales_data_analysis_disadvantage	competitive disadvantages
#high_staff_mobility_disadvantage	competitive disadvantages
#low_price_as_core_competence	core competence
#no_enterprise_identification	organizational deficiency
#no_enterprise_culture	organizational deficiency
#no_brand_ image_consciousness	organizational deficiency
#single_use_of_promotion_means	organizational deficiency
#lack_of_training_on_BI_to_employees	organizational deficiency
#BI_as_a_report_tool	BI usage situation
#no_investigation_on_customer_behaviour	BI-related usage deficiency
#no_investigation_on_customer_psychology	BI-related usage deficiency
#no_market_share_statistic	BI-related usage deficiency
#no_competitors_statistic	BI-related usage deficiency
#BI_no_personalized_function	BI-related usage deficiency
#BI_no_prediction	BI-related usage deficiency
#automatic_inventory_statistic	BI-related usage highlight
#brand_statistic	BI-related usage highlight
#sales_comparison_between_brands	BI-related usage highlight
#sales_comparison_between_categories	BI-related usage highlight