Application of Internet of Things Technology in Enterprise Marketing Management Innovation

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Abstract: Marketing is a very important part of an enterprise. A rational and scientific marketing management can not only reduce the cost of enterprise sales, but also greatly improve the competitiveness of enterprises. The purpose of this paper is to study the innovative application of enterprise marketing management based on the Internet of Things technology. The most suitable competitive strategy of the company is put forward as the centralized strategy. And put forward the clear strategy implementation details, introduced the current situation and history of the Internet of things, and combined with the development status, put forward the necessity of the enterprise marketing management system based on the Internet of things technology. It provides a guiding direction for most enterprises to formulate business competition strategies. The theory and technology used in system development are introduced, including C/S structure, B/S structure, NET Framework, AJAX technology, and database technology. The system design process is introduced in detail, including business process design, architecture design and system operation planning. The functional test cases and test environment for system testing are introduced. The results show that when 200 people log in at the same time, the response time is 1.5 s.

Keywords: Internet of things technology; marketing; marketing management; innovative marketing

1 Introduction

At present, due to the poor level of informatization in many enterprises, most of the work of sales management is still done manually. This kind of management method can barely cope in daily life, but once it is necessary to query and count the sales situation, this management method needs to spend a lot of manpower and time to query the historical sales information [1,2]. Such management efficiency will greatly reduce the competitiveness of enterprises in the market. On a global scale, a new informatization revolution is being launched, and the core of the revolution is the Internet of Things, which can realize the purpose of intelligent identification, positioning, tracking, monitoring and management [3,4].

The FMCG market in rural India is growing faster compared to urban partners with the growth of online access, mindfulness, rising incomes and evolving lifestyles [5]. Reka D's research focuses on research on rural marketing management of FMCG in India and research based on secondary data collection. Understand the elements of a thriving rural market and think about innovative systems to gain the trust of these potential consumers and remain relevant in the market [6]. IoT shares data from customer status, so its improvements will influence the ideas presented in the rollout. Fahrurrozi focuses on the client relationship of administrators, similar to a progress action plan, and analyzes the impact of IoT thing update limitations in these areas. Through extensive inspection and practice of system upgrades, ten research recommendations have been completed [7]. Design and develop a sales management system to manage the sales management of the enterprise. Through the application of the system, the digital, automated and transparent management of the enterprise sales management can be realized [8,9].

This paper designs the enterprise marketing management system. Important workflows of the system include the quotation request process and the merchandise return process. In the system realization stage, this paper adopts SOA framework, SQLServer2008 database, C# as development language, and combines JavaJ technology to realize enterprise sales management system. Finally, the system is tested in detail. Through the detailed test, it can be found that the system can meet the work needs of enterprise sales management. The system can not only realize the management of the sales process, but also include the management of the sales financial information, so that the financial management can play a greater role in the sales management.

2 Research on the Application of Internet of Things Technology in Enterprise Marketing Management Innovation

2.1 Enterprise Marketing Management Innovation

In the competitive market of marketing strategy, an important determinant is fast and efficient material flow. The correct formulation and effective implementation of logistics strategy is very important, which determines whether it can win in market competition [10,11]. The first thing we must do is to treat the logistics system as an integrated system. The logistics system involves multiple departments such as planning, procurement, inventory, transportation, and procurement. Planning, purchasing, inventory, transportation, and purchasing total revenue and expenses are considered together [12,13].

The company adopts a cautious attitude in product and market strategy, and adopts distinctive product strategy and market strategy according to the specificity of IoT instruments. The initial product pricing was relatively high, and some powerful users were screened out, and increased support in application, created a good reputation, and laid a solid foundation for the publicity and market promotion of the instrument in the future [14]. According to their own situation, product manufacturing and new market promotion should not be blindly sought for more and faster. In the daily operation of the company, the company's unique corporate image is gradually formed.

Select powerful agents or distributors, and establish and improve the system of partners. The company should seek powerful and monopolistic agents in the industry, continuously adjust and optimize the existing sales system and agency policies, set up first-level distributors, second-level distributors, protect powerful distributors, and avoid no strong dealers occupy regional resources [15,16].

1. Product strategy

With the current rapid economic development, simple product quality can no longer satisfy consumers. Creative and personalized products are more and more popular and popular among the public, becoming fashionable and trendy, so personalized sales have also become popular. Placed in the big environment of the Internet of Things, the shopping habits and product preferences of the audience will be organized into information texts and provided to the sales staff. After analyzing the information obtained, the marketers understand the consumers' purchasing tendencies and real needs, and then conveyed to product designers in order to design products that meet the individual needs of consumers, and lay a good foundation for enterprises to formulate suitable marketing plans and marketing activities.

2. Price strategy

The traditional pricing method is usually that enterprises determine the price of products based on the cost of production, sales and transportation. Today's product pricing method has been broken by the application of big data. At this stage, the customers faced by enterprises are relatively complex. Big data can help companies analyze and summarize the regularity of customers' behavior. Through further data mining, customers can predict the range of psychological expectations for customers to accept product prices, and then formulate reasonable price strategies to meet the needs of customers. Consumer demand for different pricing.

3. Personality strategy

It is difficult to achieve a personalized one-to-one experience in current marketing. Smart products under the Internet of Things can collect user behavior data. After monitoring and analysis, the results can help companies accurately analyze the preferences and preferences of different customers. Preferences, and gather common customers together, segment them, and create exclusive products for them. In view of this, traditional product marketing and services will be completely subverted.

2.2 IoT Technology

The more recognized definition of the Internet of Things in academic circles is that the Internet of Things is also called "sensor network", which refers to the use of various information sensing devices and systems such as radio frequency identification (RFID) to connect the information of all items with the Internet in real time, to achieve intelligent management and identification. The Internet of Things assigns an identification (bar code or two-dimensional code) to each item, obtains the information in the identification of the item through sensor networks, radio frequency identification (RFID) systems, infrared sensors, global positioning systems, etc. Connected with things, people and people, and people and things, information exchange will be carried out through various access networks and the Internet, so as to realize an information network of intelligent identification, locking, control, tracking and overall planning. The core of this definition is that the main characteristics of the Internet of Things are that every object can find a location, every object can be controlled remotely, and every object can communicate with each other [17].

1. Radio Frequency Identification Technology

The working process of RFID is that the reader wirelessly reads and identifies the data information stored in the RFID tag through the antenna. The reader emits a microwave signal of a certain frequency through the antenna, and the electronic tag is attached to the surface of the object to be identified, and the microwave signal sent by the antenna is obtained in the electronic tag to generate an induced

current through the micro-telecommunication in the tag to obtain the necessary energy. The data information in its own tag is pre-stored with encoded data information in a relatively standard format, and finally the reader sends it to the background system for data processing after decoding the standard format [18].

Simply put, its working principle is that after the electronic tag obtains the microwave signal of a certain frequency sent by the reader through the antenna, the electronic tag receives the signal, then returns its own information, and finally is decoded by the reader and sent to the background. However, due to the different tags, the handling is slightly different. For passive tags, the tag needs to trigger its own circuit through the microwave signal sent by the antenna, and obtain energy from the microwave signal to send data information. For active tags, the tag is powered by the internal battery itself, actively sends data information to the antenna, and then continues the subsequent workflow. For semi-active tags, the tag is partially powered by an internal battery. After the tag receives a small amount of microwave signals, it triggers its own battery to send out data information. Finally, after the reader obtains the electronic tag data information, it is sent to the background server through the network for data processing.

Radio frequency identification (RFID) is a wireless technology that can automatically identify and track tags attached to objects. By installing RFID technology in various environments—including RFID repeaters installed on sales stands, RFID readers attached to ceilings and RFID tags attached to shopping carts—customers' actual shopping paths can be accurately tracked. Shopping paths contain important information for retailers, as they describe how customers interact with the environment and make choices. By determining customers' shopping paths and purchasing habits, information about their hidden purchasing behavior patterns in stores can be elucidated. Accordingly, customer behavior patterns can be utilized as possible alternatives for decision-making in product promotion.

2. SOA application framework

Web Service is a practical SOA architecture solution. Devices that provide services based on Web Service can realize device interconnection and function mutual access. Using Web Service technology, both .NET platform and Java platform can realize interconnection and interoperability based on SOA architecture. The enterprise marketing management system based on the Internet of Things technology is a distributed deployment structure. Through the Web Service, the Internet of Things technology can be easily applied, integrating various existing system assets, management and deployment of information application systems, and realizing the goal of resource sharing.

SOA belongs to the Internet of Things, which facilitates the inclusion of data coming from several IoT devices as well as facilitating the delivery of such data among system agents, which can process such data and provide services to the users.

3 Investigation and Research on the Application of Internet of Things Technology in Enterprise Marketing Management Innovation

3.1 Enterprise Marketing Management System

The enterprise marketing management system adopts SOA architecture and realizes system architecture design through Web Service. JavaJDK version 1.8 is the programming language, SSH (Struts2 + Spring + Hibernate) is the programming framework, and the database uses SQLServer2008. By introducing the Internet of Things technology into the marketing management system, to achieve seamless integration of the two, thereby improving the operation and efficiency of marketing management.

The enterprise marketing management system based on the Internet of Things provides services in the VIEW layer in the MVC model, and realizes the display layer of the system through JSP. The display layer is mainly the interface between the system and the user. It responds to the user's request and displays the results returned by the system. Therefore, JSP is used for code development during implementation, to realize the system's response to the user's request, and to display it in real time through HTML-XML and other markup languages response data. The business logic layer is implemented based on command calls. It integrates a large number of command interfaces. Different functions on the system can call different interactive operations by calling the interfaces. The domain module layer is mainly responsible for the business objects, business rules, and calls the data persistence layer to complete the data processing in the database.

3.2 Logistics Optimization

VRPTW is based on VRP and increases the time window T to control. T is the acceptable time limit for the customer to receive the goods. T is determined by the earliest receiving time Te and the latest receiving time T1. Customers who exceed the time limit cannot accept the goods.

Let the transport vehicle be k,

$$x_{ijk} = \begin{cases} 1, & i \in (i,j) \\ 0, & i \notin (i,j) \end{cases} \tag{1}$$

Define vehicle load as D, customer demand as di; customer i service start time as tbt., the end time is toi.

According to the optimization objective of VRPTW, i.e., the minimum number of vehicles and the total route length to complete all tasks, the following formula is obtained:

$$\min Z = \left\{ \sum_i \sum_j \sum_k t_{ij} x_{ijk}, \sum_j \sum_k x o_{jk} \right\} \tag{2}$$

$\sum_i \sum_j \sum_k t_{ij} x_{ijk}$ is the total time spent carrying the cargo on the planned route.

4 Analysis and Research on the Application of Internet of Things Technology in Enterprise Marketing Management Innovation

4.1 System Function Modules

The functional modules of the enterprise marketing management system mainly include system management module, commodity management module, customer management module, sales management module and query statistics module. The function module diagram is shown in Fig. 1.

The users of the system management module are mainly system administrators, and this module is mainly responsible for maintaining the normal operation of the system.

The commodity management module mainly manages the commodities involved in the enterprise. Commodity information is the basic data of the system, and sales information can be effectively managed only when commodities are managed effectively. The functions included in the commodity management module include commodity category management and commodity information management. Commodity category management: There may be many categories of commodities involved in the enterprise, and the sales of different commodities are not the same. In order to manage commodity categories, the system designs commodity analogy management. Through the product category management function, all products of the enterprise can be classified. Within each category, there can be many subcategories. This makes category management of products more flexible. Commodity

information management: This function is mainly to manage the basic information of the involved commodities owned by the enterprise. It mainly includes basic information such as commodity name, batch, name, model, price, etc. Basic commodity information is the basis of sales management. Through this function, you can add, delete, modify and query the products of the system.
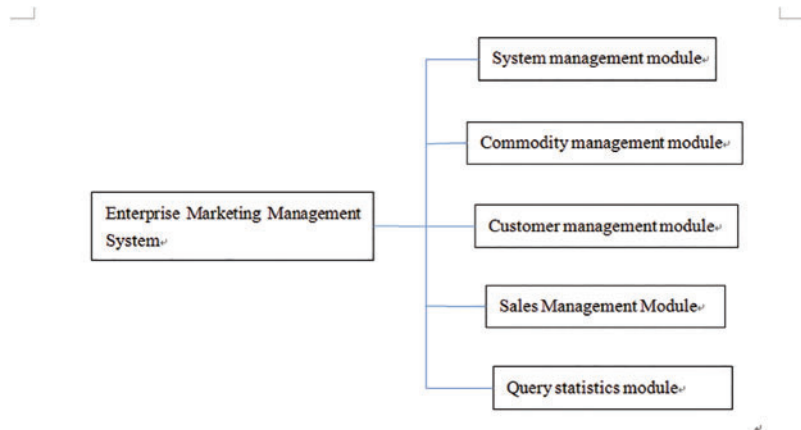

Figure 1: Functional block diagram

In addition to commodities, customers are another data base in sales management. Sales management is impossible without customers. The customer management module mainly manages the customers that the company exchanges with. The functions included in the customer management module include customer information management, customer consultation management and customer complaint management. For example, during the warehousing process of inventory management, RFID technology is used to automatically identify and collect the warehousing information of inventory through ONS The EPC sensor processes and generates the stock in list.

The sales management module is the core module of the system and is mainly responsible for all the steps in the sales management process. The users of the sales management module include sales managers, sales supervisors, sales staff, and financial staff. The functions of the sales management module include sales force management, sales activity management, sales quotation management, sales order management, sales collection and return management. Salesperson Management: The enterprise sales management system includes a loT of salespersons, these salespersons are corporate employees who really communicate with customers. In order to improve the enthusiasm of the sales staff, the basic information of the sales staff must be managed first. There are three types of sales staff in an enterprise: sales managers, sales executives, and sales staff. The sales manager is responsible for the entire sales business, the sales supervisor is responsible for the sales business in one or several regions, and the salesperson is responsible for the sales business of specific products or specific regions in each region. Administrators can use this function to add, delete, modify and query all sales personnel within the enterprise. Sales activity management: In order to increase the market share of products and improve the company's sales performance, enterprises often hold some product promotion activities. When a salesperson is promoting or quoting a customer, he must first check whether there is corresponding activity information. Therefore, the system has set up the sales activity management function. The sales manager of the enterprise can use this function to add, delete, modify and query the sales activity information of all time and all commodities.

The users of the query statistics module are mainly corporate leaders and sales executives. This module is mainly used to query and count the sales situation of enterprises within a period of time. Through the use of this module, some statistical data can be provided to the business leaders, and these data can provide data support for the decision-making of business leaders and the decision-making of related business sales activities. The functions of the query statistics module include performance query, customer sales summary, commodity sales summary and salesperson sales summary.

4.2 System Test

Functional test case: Sales order management in the sales management module is a module responsible for managing and maintaining order information signed by customers and groups. Common functions include creating, deleting, modifying, reviewing and printing orders. It can not only submit review orders to production the department can also return the processing result to the customer. In the "procurement warehousing" module, the commodity information is transmitted to the system through the reader, and the administrator can query the details of the commodity warehousing, such as the code name, model quantity, etc., as shown in Table 1. The system automatically verifies the inbound order, which is reviewed and confirmed by the administrator. The administrator can also edit the receipt document, or add a new document or delete the wrong order, as shown in Fig. 2.

Table 1: Inventory details

Encoding name	Stock name	Receivable quantity	Quantity received
0827	Spoon	1000	782
0828	Pen	800	667
0829	Cup	500	500
0830	Book	680	600
0831	Bag	700	650

Figure 2: Order information

In distribution management, vehicle management and scheduling are done automatically by the system without manual intervention. The specific method is as follows: we "add customer location" on the system, the customer address is directly imported through the order module, and we can

confirm it, unless the delivery address needs to be changed manually; secondly, we use the GIS system to understand the customer's geographic location information in real time; Finally, we click "Start Scheduling", and the intelligent scheduling subsystem generates the optimal route by itself, as shown in Fig. 3.
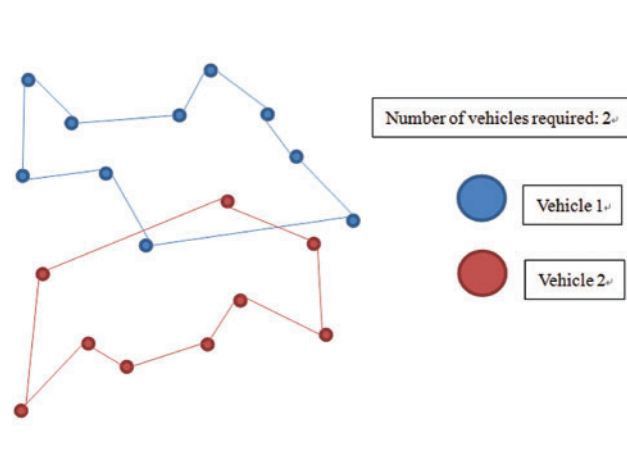
Figure 3: Optimal delivery route

The transportation management link is the most difficult to supervise. We use GPS global positioning system to install GIS module on the vehicle to track the running track of the goods, and upload the distribution and transportation of goods to the supply chain system in time through the RFID electronic tag information through the GPRS network, so as to realize the visualization of the transportation process and avoid the occurrence of missed delivery, late delivery and loss of goods. The specific implementation method is that managers first enter the distribution schedule on the system, and then use the handheld terminal to paste the MD electronic label to write the relevant information of the product. Through the system query, the product status and delivery location status can be grasped in time.

Test environment: Complete the stress test of the supply chain management system through key indicators such as concurrency, response time, and resource utilization to determine whether the goal of safety and stability is achieved. During execution, the system operates business functions through all employees of the virtual group at the same time. When a total of 250 people use it at the same time, the average response time, memory and CPU usage of the system are shown in Table 2. Through the analysis and statistics of the results recorded by init, when all employees of the group access operations at the same time, the system response time is 1.7, the system memory usage rate is 52%, and the CPU usage rate is 21%. From the data analysis, the developed system reaches the actual operation requirements to achieve the establishment target, as shown in Fig. 4.

Table 2: Test results

Simultaneous visitors	Response time	Memory usage	CPU usage
100	1.3	33%	15%
150	1.4	36%	18%
200	1.5	45%	20%
250	1.7	52%	21%
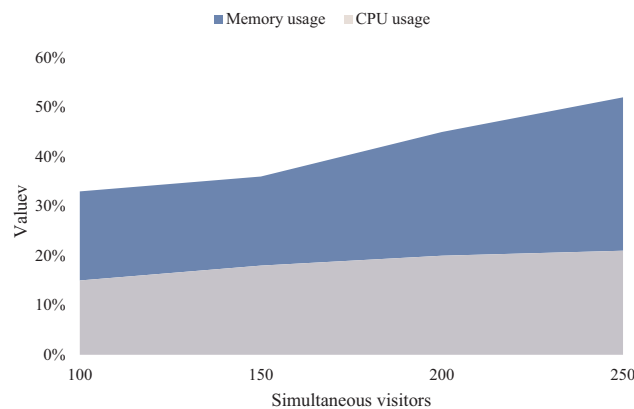
Figure 4: Test results

5 Conclusions

In order to improve the competitiveness of enterprises in the market, how to solve the problem of sales management is very important. This paper mainly diagnoses the problems of the company's marketing management system under the Internet of Things, and optimizes the company's marketing management system in combination with the external marketing environment. It is proposed that under the background of the Internet of Things, the company's original marketing management system has been difficult to support its development, and it faces the problem of marketing management system. Establish innovative methods for enterprise marketing management, and propose enterprise marketing management systems for problems. The system can completely change the way of manual management in the past, improve the efficiency of management, and reduce the possibility of data errors. In addition, the sharing of sales data is realized to prevent the accounts from not being updated in time due to the unsmooth exchange of information.

Availability of Data and Materials: The experimental data are available from the corresponding author upon request.

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.

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