Scheduling Work Shifts to Fit Customer Buying Behavior
-- Increasing Time Waiting on Customers and Subsequently Retail Sales by Improving Work Efficiency --
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Abstract
Many things are being done to improve productivity in retail sales and other businesses in the service industry. While a lot of effort is directed at cutting or streamlining costs, it is also important to enhance customer satisfaction and service quality.
The Marui Group is trying to improve store operations from the three viewpoints of “product selection,” “customer services” and “store ambiance.” In this paper, we report our efforts to re-examine the existing sales system with use of IT and engineering approach.
Consumer tendency to visit a particular store varies according to store location, day of the work, time of day and products sold. Therefore, to achieve a constant quality of concierge service, it is necessary to allocate sales staff meeting the fluctuation of customer traffic. To achieve this allocation, we analyzed POS data and investigated the consumer tendency to visit stores with cameras, extracting the consumer tendency for each time zone and sales floor. We also developed a shift scheduling software, KKE/ShiftMaster0101, which achieves to schedule a shift which corresponds to the fluctuation of customer traffic for each sales floor. In this paper, we also report the effectiveness of this system.

1 INTRODUCTION
1.1 Customer Services
The Marui Group is trying to improve store operations from the three viewpoints of “product selection,” “customer services” and “store ambiance.” Within that, they decided to reexamine their sales floor system in order to improve the quality of services for customers who come into their stores

1.2 Quantification of Customer Behaviors and Sales Floor Operations
To grasp the current situation, they began as the first step to investigating consumer tendency to visit their stores by installing cameras on the sales floor to monitor the number of customers coming into the stores and how long they stayed (using Vitracom SiteView image sensing software from Kozo Keikaku Engineering (http://www.kke.co.jp/keisoku/siteview/)). At the same time, they timed the work content of store staff to quantify how much work they and the store were doing. From that, they calculated the number of personnel needed to wait on customers and the number needed for back office operations (handling deliveries, returns, etc.).

![Fig. 1 Consumer tendency to visit stores and amount of work by sales floor staff](image-url)
Fig2. Customer traffic and staff's working plan
(The red line represents the required hours for the service and the gray the staff's work hours. In this case, it turns out that too many staff is available in unbusy time, and too little in busy time. As a result, we found that a few percentage of improvement in service amount can be expected by adjusting the balance for weekdays, weekends, holidays and each time zone.)

It was understood from the obtained information that the amount of time spent waiting on customers could be increased by several percent by appropriately adjusting work shifts according to weekdays, weekends and holidays, and time of day.

1.3 Introduction of Shift Scheduling Software

Scheduling work shifts relies heavily on the experience and intuition of managers. The task requires skill and, depending on who did the scheduling, the results were very inconsistent. Therefore, software was introduced to enable anyone to prepare shift schedules of a determinant level of quality.

2 SHIFT SCHEDULING

2.1 KKE/ShiftMaster 0101

In general, store staffs often ask for consideration (fairness) when shift schedules are drawn up. This comes in addition to conditions placed on shifts such as absolute rules peculiar to the business (laws, workplace rules, etc.). Resultantly, preparing a shift schedule that takes into consideration the complexity of conditions is a very difficult job. KKE/ShiftMaster (http://www.kke.co.jp/orsim/ShiftMaster).

KKE/ShiftMaster is a registered trademark), a general-purpose shift scheduler (Takeda, et al., 2009) developed by Kozo Keikaku Engineering, allows users to set workplace conditions in detail. We customized it as “KKE/ShiftMaster 0101” for the Marui Group, who has been using it since October 2010 (Kameyama, 2010).

2.2 Software Features

The software has the following features.

1. Automatically adjusts staff to sales floor demand.
2. Internally registers labor regulations, company rules, etc.
3. Interface and configuration based on usability

These features are explained in greater detail in the following sections.

2.3 Consumer Tendency to Visit Stores

It is known that consumer tendency to visit a particular store varies according to store location, day of the week, time of day and products sold. Therefore, a mechanism is provided in the software to identify this tendency based on POS data collected in each store every month, and to utilize that information as a condition for scheduling shifts.

2.4 Setting Shift Scheduling Conditions

Even for the most basic points, there are several tens of conditions to consider when preparing shift schedules. Yet, the only conditions that differ with each store are the opening – closing system and the number of team members needed. One condition that is the same for all stores and never changes is that one manager is needed to match staffing to the ebb
and flow of demand. The software is designed to automatically satisfy that kind of condition, rather than have the user set it. This makes it possible to recommend loose practices of the past as unified standards of the company.

2.5 Usability

Much has been done with the software's configuration and features to ensure usability. To begin with, users can easily emulate formats of existing shift schedules and move them to the main window. And, shift schedules can be output to Excel files for use in other operations.

KKE/ShiftMaster 0101 can also link to existing internal systems, making it possible to automatically register personnel information, service records, fixed working hours of each individual store and more, as scheduling conditions. Therefore, just by setting conditions in consideration of desired staff holidays, training schedules, sales events and so forth, shift schedules can be computed every month.

![Main window in KKE/ShiftMaster 0101](image)

Fig. 1 Main window in KKE/ShiftMaster 0101 (Sunday and Saturday columns are colored with red and blue respectively. The shifts violating the required rules are colored with red, and the shifts not satisfying the recommended criterion are colored with yellow.)

Shift schedules can also be manually edited. And, if schedules that violate set conditions are attempted, a warning appears on the screen to prompt corrections. These warnings are displayed not only for user-set conditions, such as staff's day off demands, but also conditions registered in the software, so nothing is hidden from users.

3 BENEFITS

The primary benefits of introducing KKE/ShiftMaster 0101 are given below.

1. Increased time to wait on customers

Using this software increased the amount of time spent with customers by about 3%. Moreover, because it uses past records and cover based on past records as a quantitative index, it can compute very satisfying shift schedules.

2. Made scheduling work more efficient

Because team assignments for each store can be set in detail, the automatically generated shift schedules are very precise. Whereas anywhere from 3 to 10 hours were spent creating shift schedules before the software was introduced, anyone can now prepare highly precise schedules in a short amount of time.

3. Made other operations more efficient

Shift schedules are also used to schedule work in the store on a daily basis. In the store, detailed schedules were often prepared and managed as Excel files, but owing to the built-in export feature, the data from the schedules created with this software is being output to Excel for use on the sales floor. Moreover, it links with the company's attendance management system, which makes it possible to automatically clock in for schedule shifts from this software. It has eliminated tasks that had taken time to manually register the attendance plan to the system.

4 CONCLUSION

When KKE/ShiftMaster 0101 was first introduced, it was utilized by 50 to 60 stores, but its scope of application has expanded since then. We will search for ways to further improve the software by proposing and testing quantification theories and incorporating user demands.
KKE/ShiftMaster is a general-purpose shift scheduler, therefore, besides the retail applications like the example presented here, it can be used to schedule shifts at hospitals and logistics centers, or to schedule checks and maintenance. In regards to this latter application, many locations schedule checks and maintenance according to customer preferences, but KKE/ShiftMaster is already being used to do so and has produced great results (Kato and Kukino, 2010; Kato, et al., 2012). We want to apply the software to other industries to help them solve the issues they might have scheduling work shifts.

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