고객 서비스 센터 모델의 개발 - 제2차 TEFEN/IIE Graduate Student Competition 출품 자료에 근거

유 우 연 *
김 희 동 **
양 재 경 **

1. INTRODUCTION

SolarIS is a leading provider of solar-based devices. In order to provide excellent customer service and meet new service level requirements, SolarIS plans to found a centralized customer support department that will be the core of the customer support supply chain management. The staff of the new department will consist of the contact center agents, field service technicians, system installation experts, and engineering staff.

The objective of this study is to develop a comprehensive user-friendly staff modeling system for the SolarIS Customer Support department. A staffing model is generally applied to identify the ideal size and schedule of the workforce. The staffing model developed in this study provides the optimal configuration of the customer support supply chain including the optimal number of staffs assigned in each region and the detailed schedules for each type of staffs such as shift patterns, shift starting times and the number of staffs needed in each shift, so as to minimize the total cost while satisfying the customer service level.

A staffing model problem has attracted considerable attention in the literature because it directly affects the total cost as well as the customer satisfaction. A variety of techniques such as a stochastic model, simulation, integer programming model and heuristic method have been employed to solve the staffing problems. In this study, the integer programming models for each type of staffs were developed to find the optimal number of staffs. The integer programming models has flexibility so that they can be applied with various situations as well as for the future use if the detailed data is available in the future. In addition to the integer programming models, data mining usage is also presented.

* 삼성 SDS
** Iowa State University

2. MODEL DESCRIPTIONS

In this section, two models, the current model and the developed model, are briefly described. For each model, operational characteristics are identified and presented.

2.1 Current Model

In a current model, a customer directly contacts a local distributor for customer support and a local distributor provides customer support according to its available schedules. With the current system, each local distributor needs to have all staffs including the contact center agents, field service technicians, system installation experts, and engineering staff in order to provide customer support. The other characteristic of the current system is that a contacted local distributor always provides a service for the customer. No communication has been made between local distributors. Therefore, it could happen that one local distributor are very busy while the other is idle even though two local distributors are located each other close so that any of them could provide customer support.

2.2 Developed Model

In order to meet new service level requirements and increase customer responsiveness, SolarIS will launch a centralized customer support department that will be responsible all contacts made with SolarIS's customers. In addition to a centralized customer support location, SolarIS also intends to open local customer support places, which will replace local distributors. The main difference between the new local customer support places and the existing local distributors is that the new local customer support places are directly scheduled, controlled and managed by the centralized customer support department.

Having both of the centralized customer support department and the local customer support places provides the following advantages superior to having local distributors only. First of all, the new centralized customer support department will be able to evenly assign tasks to the local customer support places for faster service completion while the old local distributors serve all the service requests by their own. In a new model, the other nearby customer support place can help when there are high demands. Also, the new model requires less contact center agents by

having one centralized contact center. Furthermore, it may be possible to decrease the number of local customer support places by increasing the customer responsiveness. Having less number of local customer support places will result in less operation cost.

3. MODEL DEVELOPMENT

The graphical descriptions about the developed model are presented in Figure 1. In this section, the brief descriptions of each function in Figure 1 are presented.

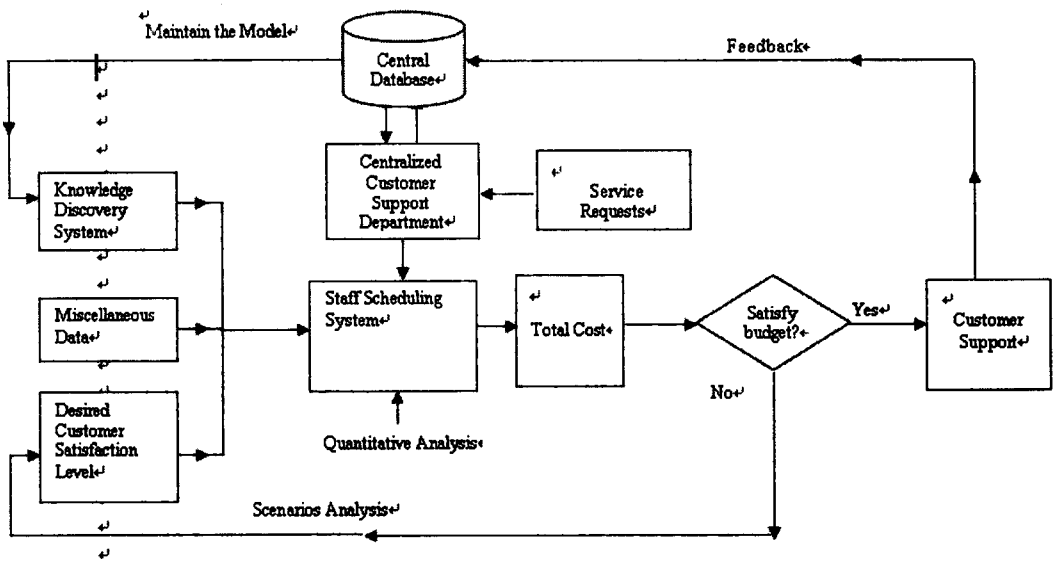


Figure 1. The Configuration for SolarIS Customer Support Staffing Model

3.1 Staff Scheduling System

This system determines how many each staff is assigned to each customer support place so as to minimize the total operation costs while satisfying the customer satisfaction level. To solve the problem, the quantitative analysis using integer programming is used. By solving the problem, the total operation costs as well as the number of staffs assigned in each customer support place are found. With the

information a centralized customer support department has (i.e. the current schedule of a local customer support place, the availability of staffs in each local customer support place and so on), the staff scheduling system will generate and assign customer support tasks to each local customer support place.

3.2 Maintenance of the Developed Model

One of the most attractive characteristics of the new model is easy to maintain it. Central database stores all information related to the customer support supply chain including the schedule and availability of each staff, information about each local customer support place, and the feedbacks from the served customers, etc. Therefore the new configuration of the customer support supply chain can be found anytime when it is desired.

3.3 Knowledge Discovery System

Using the data mining techniques, the knowledge discovery system will be used to predict appropriate number of staffs when data for service conditions such as service completion time since contacted by a customer, service quality and the number of each type of staffs in a local customer support location are given. In addition, the results obtained from the knowledge discovery system will be used as an input for the staff scheduling system.

3.4 Desired Customer Satisfaction Level

A user or decision maker can assign a minimum customer satisfaction level which he or she would like to achieve.

3.5 Scenarios Analysis

The solution found from the staff scheduling system is the best solution under the given customer satisfaction level. If the total cost of the best solution exceeds the budget limits, a lower customer satisfaction level can be easily applied to the system and the new best solution can be found again under the applied lower customer satisfaction level until the solution meets the budget limits. Furthermore, by varying several parameters such as MTTR (Mean Time To Repair), MTBF (Mean Time Between Failure), etc., other solutions depending on situation that the SolarIS has can be found.

4. IMPLEMENTATION

4.1 OptStaff Software Development

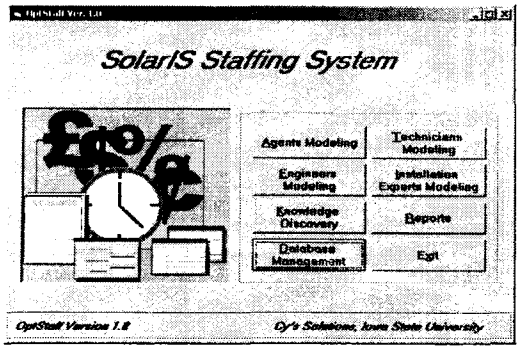
Based on the system configuration presented in the previous section, Optstaff was developed to solve a staff modeling problem for SolarIS. Optstaff is an analytical tool used to determine staffing requirements and schedules based on the mathematical model. It also has capability doing scenarios analysis ("What-if" analysis through the various levels of parameters) and creating a variety of graphs and reports with user-friendly interfaces.
The following software tools are used to make user interfaces, analyses, reports, and databases

- Microsoft Visual Basic: User Interfaces,
- Frontline Systems Excel Premium Solver Platform: Optimization,
- Microsoft Access: Database,
- Weka Knowledge Explorer Data Mining and Knowledge Discovery (Not yet developed).

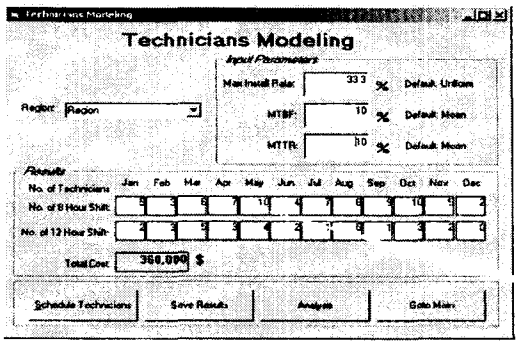
Figure 2 shows the sample screens of OptStaff software. Figure 3 shows the example of the results obtained after applying OptStaff to the SolarIS customer support department problem.

5. CONCLUSIONS

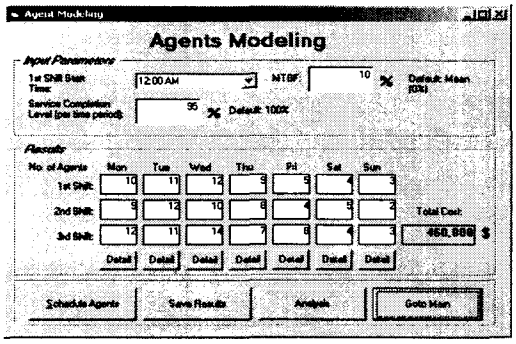
In order to solve the staffing model problem, a comprehensive user-friendly staff modeling system, OptStaff, was developed. OptStaff is an analytical tool used to determine staffing requirements and schedules based on the integer programming model. It also has capability doing scenarios analysis and creating a variety of graphs and reports with user-friendly interfaces.



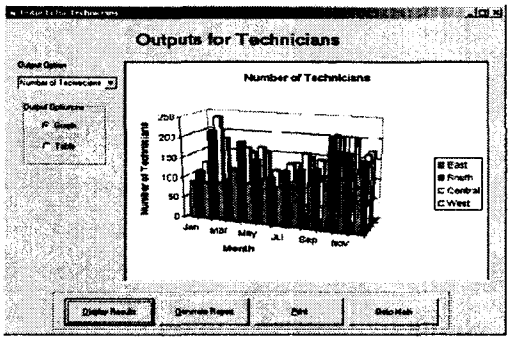
(a) OptStaff Main Screen



(b) OptStaff Technicians Screen

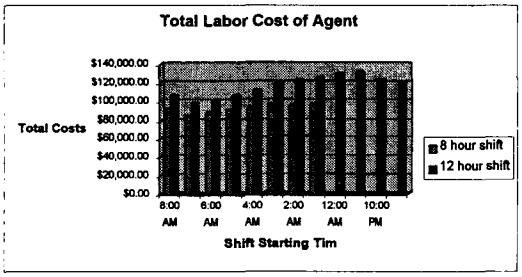


(c) OptStaff Agents Screen

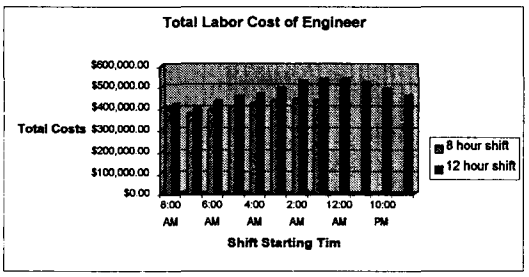


(d) OptStaff Output Sample Screen

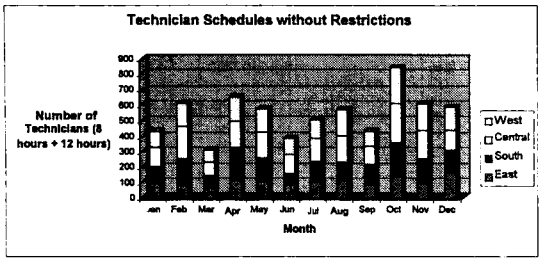
Figure 2. Sample Screens of OptStaff Software



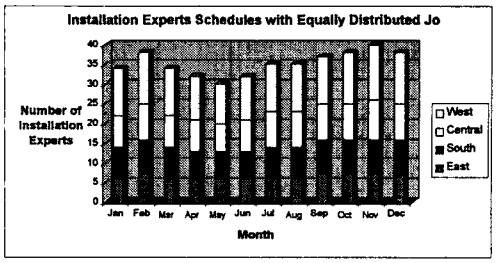
(a) Total Cost of Agents



(b) Total Cost of Engineers



(c)Technicians Schedule



(d) Installation Experts Schedule

Figure 3. Example of Results obtained from OptStaff

Applying the OptStaff, the number of each type of staffs according to several situations and its total labor costs were obtained. For the call center location selection, it appeared that the centralized call center is better option than regional call center. The best location for the call center where agents and engineers are serving customers is south region. For the technicians and installation experts scheduling, various results under several situations were also found. Thus decision makers can apply the favorable results that he or she would like to use.