

WEB-BASED FIELD SERVICE SYSTEM

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Abstract: Companies are continuing to place more emphasis on all types of customer services, including field service. Field service is defined as the processes involved in servicing products in the field after they have been sold. It is a specialized subset of functions under the broad umbrella of Customer Relationship Management (CRM) and represents a growing market for software and solution vendors. This paper first presents the general processes that build up a service operation. This is followed by evaluation of current Field Service applications in the marketplace. Based on the analysis, Field Service System (FSS) is proposed. This system consists of five modules namely service call management, user management, sales management, dispatch management and work order management. FSS provides the following functionalities: scheduling of work among the field service workers, management of customers and parts information, reports generation and monitoring as well as measurement of field service activities. In addition, FSS is web-based thus providing access to field service functions from anywhere, anytime. It is developed using ASP.NET. The methodology employed, design and implementation of FSS are discussed. As a conclusion, FSS allows small and medium sized field service organizations to effectively manage their customer service.

Keywords: Field service system, Web-based, ASP.NET.

INTRODUCTION

Companies are continuing to place more emphasis on all types of customer services, including field service, recognizing them as an opportunity to build relationships and foster additional revenue. Field service is defined as the processes involved in servicing products in the field after they have been sold [5]. It is a specialized subset of functions under Customer Relationship Management (CRM) and represents a growing market for software and solution vendors.

In today's market, a wide range of field service management solutions is available. They range from simple systems which merely automate the field service processes to very comprehensive systems that integrate with other CRM and enterprise systems. However, field service still lacks the cachet of other applications like marketing automation or Web-based customer service. Moreover, the high cost of existing field service systems in the market hinders some organizations from procuring the systems. That is why the service operations for some service organizations, especially small or medium sized organizations, are not automated but still done manually. This caused delay in service delivery time, decrease in customer satisfaction and reduce in organization profitability in the long run. Hence, Field Service System (FSS) was proposed as a cost-effective solution for small to medium size field service organizations. It is a web-based system that aims to streamline and automate the field service functions. FSS was designed to include the basic functions possessed by most field service applications in the market.

The remainder of this paper first presents the general processes that build up a service operation and discusses the current field service applications in the marketplace. Based on the analysis, FSS is proposed. The methodology, system design and implementation, as well as the results and discussion are presented. The conclusion rounds off the paper.

Literature Review

Field service operation: The field service operation generally comprises of several processes [1] (Figure 1). The first process is "customer call". A customer call initiates the field service process. Customer information and problem description are logged and customer qualification is verified. The work order opened in this step is tracked and managed until closure. The next process is "dispatch" where pending work orders are assigned to technicians, taking into account the customer's entitlement,

priority of the problem, technician expertise and route coverage. The following process, namely “drive to site” involves the technician traveling to customer site to perform the service. At the customer site, the technician performs service and this is known as “fulfill order/repair” process. Subsequent process i.e. “inventory management” coordinates the flow of good and bad parts between warehouses, stocking centers, technician vehicles etc. If all work is completed, the technician carries out “close work order” process, where he closes the work order and captures data that feeds into customer history records, performance measurement, product design and sales forecasting. Finally, “time report/billing” process is carried out where the technician’s time and materials information is submitted to the accounting department and invoice is issued to the customer.

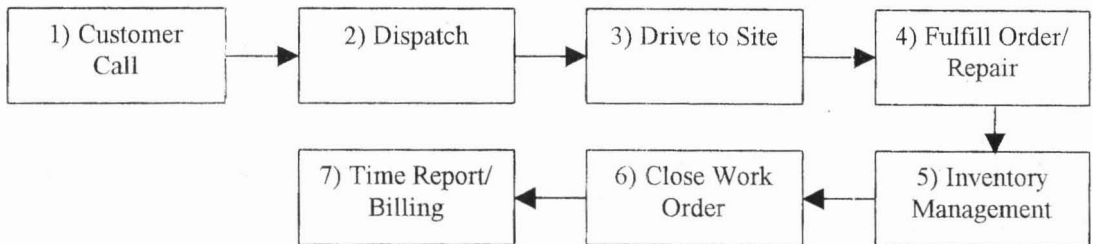


Figure 1: Field service processes [1]

Current field service management solutions: A number of systems designed to automate field service operation existed in the market. For example, Microsoft Business Solutions that offers two distinct field service management solutions i.e. Great Plains and Solomon, ServicePower, Siebel Field Service, Peoplesoft and Metrix.

Microsoft Business Solutions for Field Service Management – Great Plains was designed to meet organizational profitability and customer satisfaction. It consists of ten powerful modules (Contract Administration, Depot Management, eReturns, eService Calls, eTech, Field Service, Preventive Maintenance, Returns Management, Service Call Management and TechAssist) that allow the management of all aspects of field service operations [7]. On the other hand, Solomon offers a comprehensive solution that automates all operational and accounting areas of a service business with full integration to financial modules [8].

ServicePower provides intelligent service scheduling solutions based on constraint-based artificial intelligence technology [11]. It has a suite of software products that supports planning, scheduling, service delivery and performance management. Another existing field service system is from Siebel. It supports closed-loop problem resolution with wireless messaging, call handling, schedule optimization, shipping, receiving, depot repair, parts logistics, inventory management and invoicing. It is fully integrated with all Siebel eBusiness Applications and can be integrated with existing third-party applications and legacy systems [12].

PeopleSoft Enterprise Integrated FieldService provides a flexible service-order and dispatch management solution [9]. It is built on PeopleSoft’s Pure Internet Architecture, a configurable and extensible framework that leads to easier integration, faster implementation, fewer customizations, and reduced maintenance and training. Metrix provides eProductService, a system which is web-based and caters for field service, repair center operations, contract and warranty management as well as support call centers [6].

These systems differ in content, features, scopes and objectives, but the common features that they shared are:

- Service call management that supports customer request and order based on service-level agreement.

- Contract/service agreement administration that manages customer and equipment contracts and warranty details. It tracks the details of the equipment which includes installation dates, meter readings, or the history of the replacement of parts.
- Work order/dispatch management that provides scheduling/dispatching through views of technician locations and schedules, assigns jobs using skill sets, availability, location and tracks job status. It also provides related information such as requisite parts, relevant customer details etc.
- Technician management that allows technicians with laptops or mobile devices to check assignments, schedules, parts availability, customer information as well as generate reports and billing.
- Inventory/parts tracking and management that tracks parts information such as usage, requirements and the failure rate.

As compared to other field service applications that offer fairly complete range of capabilities for field service management, FSS is designed for small to medium sized field service organizations. Since it can be used to connect customers and employees anytime, anywhere, it will help to increase efficiency and reduce costs.

METHODOLOGY

Structured Systems Analysis and Design Methodology (SSADM) was used in the analysis and design stages of FSS development. SSADM is a type of structured methodology which is based on modeling [13]. Two common techniques are used in SSADM; logical data modeling and data flow modeling. During the design phase, Entity-Relationship Model and Data Flow Diagram was used to identify, model and document the data requirements and the flows of data within the system, respectively. SSADM employs decomposition approach where a system is decomposed into smaller modules. As such, FSS was developed modularly.

SSADM was chosen because in this methodology, each module of the system is a self-contained set of activities with its own inputs and outputs. Thus, each module can be understood easily and the achievement of the milestone can be evaluated clearly. Besides, SSADM adopts a prescriptive approach to development; it specifies in advance the modules, stages, steps, tasks, deliverables and the techniques involved [4].

System Design

The FSS's system architecture is based on the client-server architecture where it is broken down into three tiers; presentation, business and database [10]. There are five main modules in FSS. Service Call Management, User Management, Sales Management, Dispatch Management and Work Order Management. Each main module in FSS is built for specific user. Service Call Management module is mainly for the organization's customers to request for service, to check the service status, to view personal and contract details through the Internet. User Management module is developed for the system administrator to manage the employees' profiles and to view the customers' profiles. Sales Management module is targeted for Sales and Marketing personnel, to allow them to manage all the information related to the customers including profiles, products sold and service agreement. Dispatch Management module is built for technical manager to manage service orders, create work orders, dispatch and schedule technicians to jobs as well as to generate various reports. Lastly, Work Order Management module helps technicians by providing them access to essential customer, service and product information for each work order that is assigned to them. Technicians can also check their jobs, enter completed work and claims.

System Implementation

System implementation involved the translation of the software representation produced during design into computer readable form. For FSS, this involved the system development environment, program coding and database implementation. FSS was developed using ASP.NET [2]. Its database was hosted

on Microsoft SQL Server 2000 which acted as the backend. The database was built based on the logical model produced during system design.

The following contains the descriptions of the five main modules of FSS. All the five main modules provide a sub-module known as “my account” that allows the user to change his password. The Service Call Management module (Figure 2) contains four sub-modules; “service request”, “order status”, “details” and “my account”. It enables the customers to place service request based on the purchased product(s), check the status of the order and view their personal or contract details. The User Management module (Figure 3) consists of three sub-modules: “employee profile”, “customer profile” and “my account” to allow system administrator to manage the employees’ profiles, to view customers’ profiles and to change his password.

In Sales Management module (Figure 4), authorized users from sales and marketing departments can view and modify customer, contract and parts information, through “customer profile”, “contract management” and “parts management” sub-modules. Dispatch Management module (Figure 5) consists of four sub-modules i.e. “work order listing”, “preventive maintenance”, “reports” and “my account”. Technical manager views work order listing to monitor open and completed work orders, check the customer’s qualification, view technicians’ schedules and assign technicians to work orders. The “preventive maintenance” sub-module shows the upcoming service agreements by month and allows the conversion of preventive maintenance into service order. “Reports” sub-module produces technician productivity report, category service rate report and closed work order report for the respective month and year.

Work Order Management module (Figure 6) comprises of five sub-modules namely “schedule”, “solutions”, “parts”, “closed work order” and “my account”. Technicians are able to access their own schedule, work order details and submit closed work order report as well as claims online. In the “solutions” sub-module, the technicians can search for solutions to past service requests and used them as references to solve the current problem. The “parts” sub-module allows the technician to check for the availability of certain parts.

The screenshot displays the main interface of the Service Call Management module. At the top, there is a navigation menu with options: Service Request, Order Status, Details, and My Account. Below the menu, the date and time are shown as Saturday, April 03, 2004, with a Logout link. The central part of the screen is a form for creating a service request. It includes the following fields and values:

- Customer ID: C0005
- Name / Company: IT Solution
- Product: P0010 (with a dropdown menu showing Canon S2005px)
- Problem: Printer can't feed paper properly
- Level of Emergency: Tolerance

At the bottom of the form, there are two buttons: Submit and Cancel. Below the form, a message states: "Your service order number: SVC-2004-00039".

Figure 2: Main screen of Service Call Management module [3]

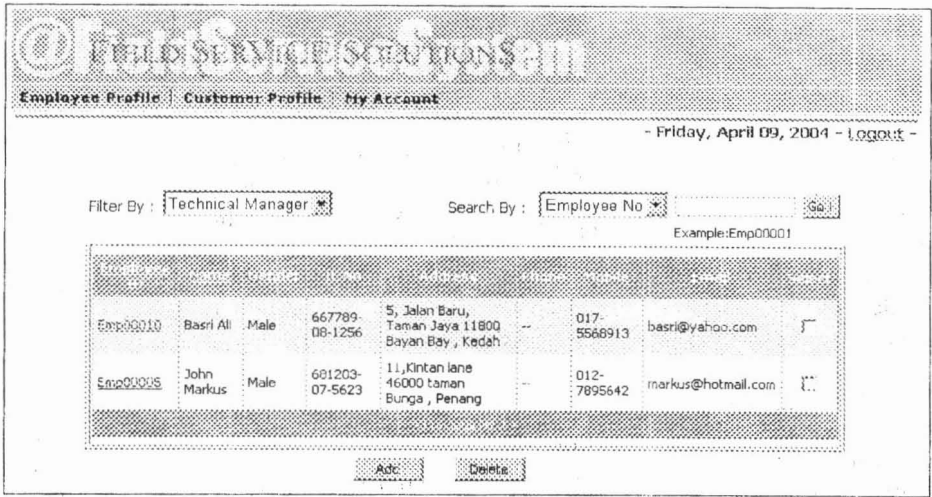


Figure 3: Main screen of User Management module [3]

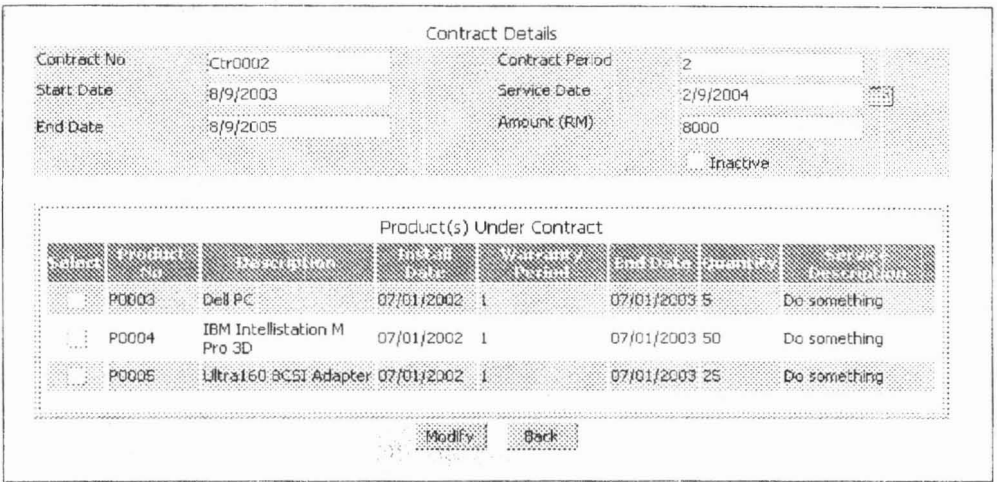


Figure 4: Contract Management of Sales Management module [3]

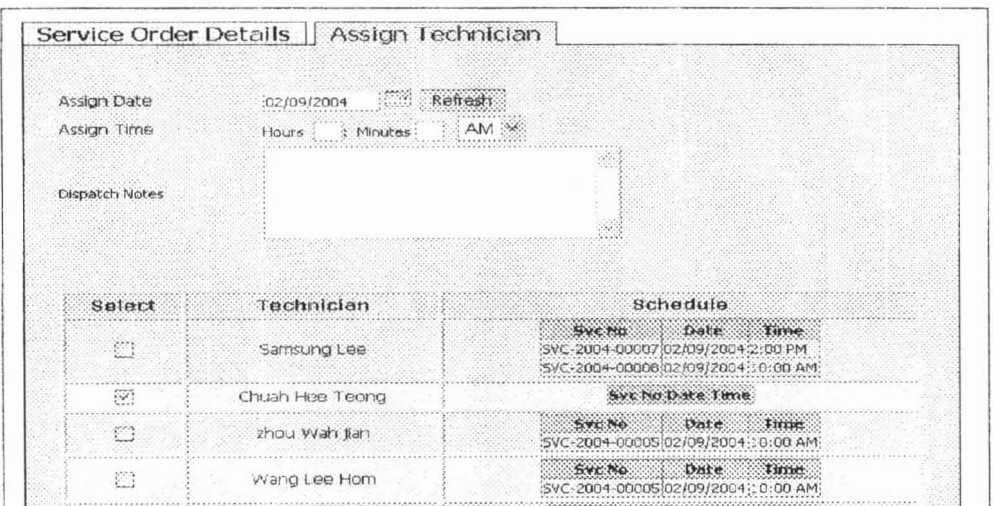


Figure 5: Assign Technician of Dispatch Management module (3)

Work Order ID	Status	Customer	Product Type	Created Date	Assigned Time	Priority
SVC-2004-00007	Open	Long distance	warranty	02/09/2004	2:00 PM	Urgent
SVC-2004-00008	Open	Software Center	preventive maintenance	02/09/2004	10:00 AM	Routine
SVC-2004-00010	Awaiting Parts	EasyOne	preventive maintenance	01/12/2004	10:00 AM	Routine

Figure 6: Main screen of Work Order Management module [3]

RESULTS AND DISCUSSIONS

The development of FSS was focused on helping the small and medium sized field service organizations to effectively manage their field service by facilitating the scheduling of work among the field service workers, management of customers and parts information, reports generation, monitoring as well as measurement of field service activities. Feedbacks from the users and the testing outcomes revealed several key strengths of FSS. The interface of FSS is simple and user-friendly, making it easy to use. FSS also provides the necessary security. Only authorized users can access the system, users' passwords are encrypted and pages cannot be browsed once the user logged out from the system. FSS was also built with effective error handling. Besides, as a web-based application, FSS is accessible anywhere and anytime, provided Internet connection is available. It also offers reasonable response time because each page is designed to be lightweight. However, FSS does not support online help module and mobile field service. These functionalities are the possible future enhancements to the system.

In this paper, the current field service management solutions were surveyed. Field Service System (FSS) is proposed as a web-based solution to streamline and automate the field service functions. It is cost-effective and is suitable for small and medium sized field service organizations. Besides, as a web-based application, it can be accessed from anywhere and anytime.

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