AN INFORMATION SYSTEM TO IMPROVE CUSTOMER SERVICE IN A MAJOR RETIREMENT COMMUNITY

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ABSTRACT

This paper describes a case study where the impact of implementing information technology resulted in a dramatic improvement in the level of customer service and health care provided to senior citizens living in a major retirement community. William Cox is one of the largest senior living communities in the State of Missouri, suffered from poor management of their data resources, such as the loss of residents' diet information, continuous erroneous manual diet changes, lack of human resources to execute frequent diet changes, and low morale of employees. All these problems combined were potential for customer service deterioration and dissatisfaction and ultimately a profit loss.

Keywords: customer service, SDLC, DFD, UML, myDiet, Use Case

PROBLEM DESCRIPTION

William Cox Community is one of the largest senior living communities, 400 acres, in the United States. Its mission is to enable adults to maintain dignity and independence through offering, at a good value, a high quality housing and residential, social, recreational, cultural, and health services. From health care to lawn care, security to snow removal, the village offers a lifestyle that's virtually worry-free. Prior to admitting any senior citizen to the William Cox Community, he/she will be subjected to a thorough medical examination, called *diagnosis-prior-to-admission*, by a physician. The physician, based on diagnosis and the resident's personal food taste preference, will then design a diet regime for the new resident. This diet regime will then be sent manually to the dietary unit manager who is responsible for instructing the kitchen unit to prepare three daily meals for all residents according to their diet regimes. The dietary unit manager keeps all diet regimes and food preferences for all residents in a small database on a personal computer. Every time a resident requests a change in his/her diet or food preference, he/she has to hand deliver the request to a nurse during the nurse's daily round. These requests are collected and saved in a nearby nurse station. After receiving the request, the nurse may approve it or send it manually to the resident's physician for a decision. Next, the nurse has to walk to the dietary unit office to hand deliver the decision to the unit manager. Finally, the manager would make the change on his/her database, print a new diet slip, and hand it to the kitchen unit. The resident will not see any change in his/her meal before eating at least ten meals based on the old regime or food preference that he/she did not like. It is needless to explain residents' dissatisfaction, which means eventually a loss of profit.

After conducting multiple interviews with the village personnel, we were able to summarize these problems as follows:

1. Long walking distances for nurses in order to collect change requests in diet and food preferences.

2. Lack of human resources required to collect the change requests
3. Possible loss of data when transferring information from nurse stations to the dietary unit then to the kitchen unit.
4. Diet changes are prone to error since they are handled manually.
5. Long waiting times for residents before any change in their food becomes effective.

DESCRIPTION OF THE PROPOSED SYSTEM

This is a typical classroom case study where the very basic concepts of Systems Analysis and Design are directly implemented. Although there are other valid approaches to software development, which may yield different alternatives, we have chosen to follow the top-down structured approach.

Users' Requirements Determination

Our first task during the development process was to compile a list of requirements. As a result of conducting multiple interviews with William Cox personnel, it was made clear to us that there is a need for a system which would perform these functions:

1. Keeping three categories of detailed information about each resident: Personal, Diet, and Physician reports (which include the initial diagnosis as well as any other follow up).
2. Allowing physicians, nurses, the dietary unit, and kitchen personnel to access residents' diet information in order to provide faster response and eliminate errors.
3. Providing access to residents' information from anywhere on campus, as well as any other William Cox facility. This will save the time and effort wasted on walking and remedy the lack of human resources needed to collect diet change requests.

Process Modeling

After a thorough study of the functions of the proposed system (named ***myDiet***), we modeled the system processes using Data Flow Diagrams (Hoffer et al., 1999; Whitten et al., 2001). Figure 1, below, shows the Context DFD, while Figure 2 shows Level-0 DFD.

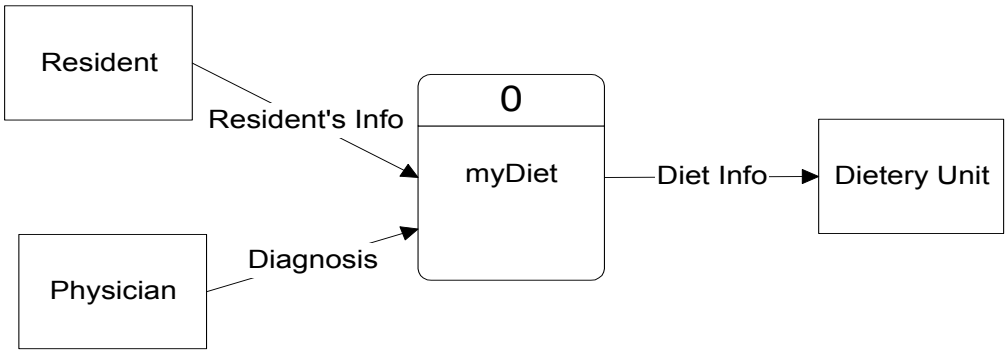

Figure 1, the Context DFD of ***myDiet***

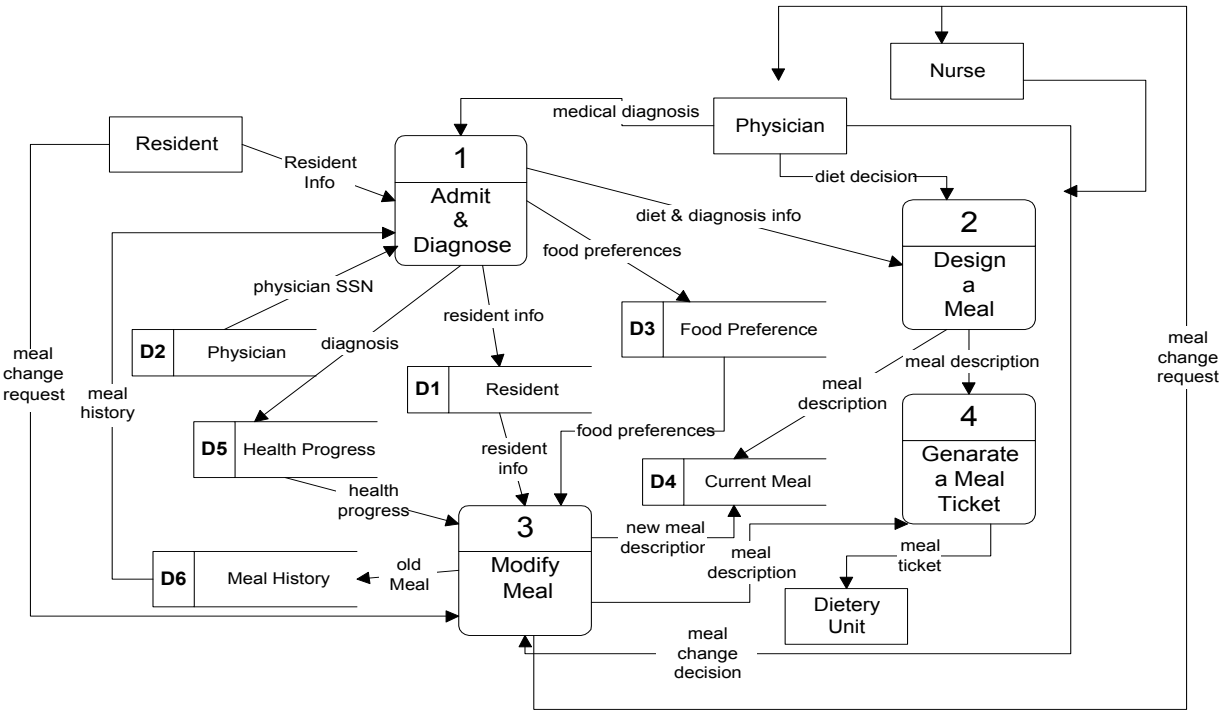

Figure 2, Level-0 DFD of *myDiet*

Although we decided to follow the structured approach, we think it is beneficial to show some analogous tools when following the object-oriented paradigm. A use-case diagram, shown in Figure 4, is one such tool, which is similar to the DFD's. It is used to understand the functionality of the system at a higher level. It illustrates in a very simple way the main functions of the system and the different kinds of users (actors) that will interact with it (Dennis et al. 2002).

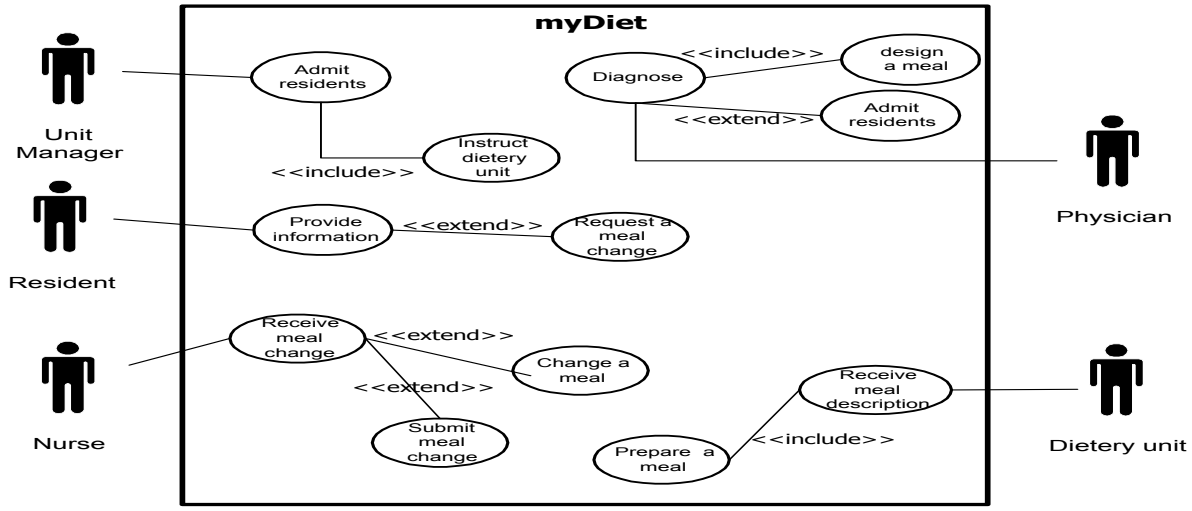

Figure 4, Use-Case using UML for the ***myDiet*** system

Data Modeling

In order for the system to function properly, the required pieces of data and their relationships have to be identified. We have utilized the Entity Relationship Diagram ERD, which is a

graphical tool showing data entities and their relationships (using the ERD Chen's notations explained in (Dennis and Wixom, 2000; Hoffer et al., 1999; Jordan and Machesky, 1990; Whitten et al., 2001). The ERD for ***myDiet*** is shown in Figure 5 below, attributes are not shown, however, due to space limitation.

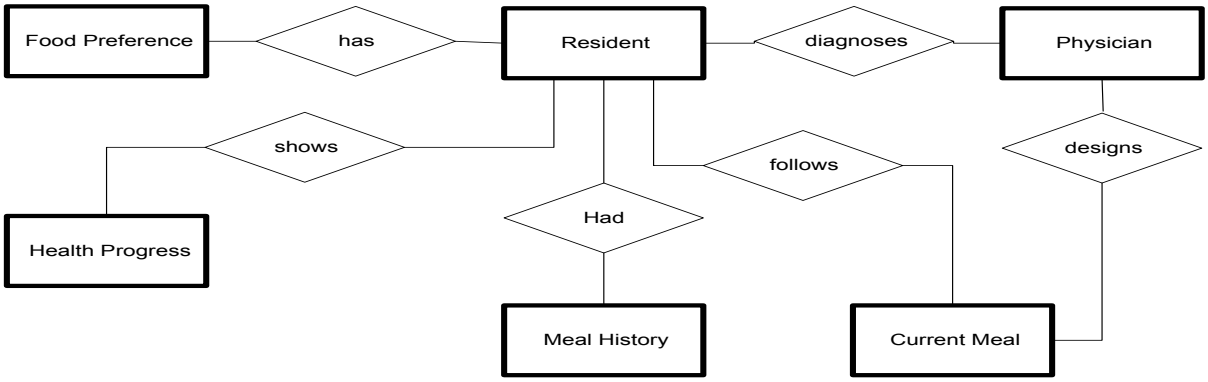

Figure 5, The ERD of ***myDiet***

Again, it is important to highlight the fact that, when following the object-oriented paradigm to software development, there exists a tool, which is similar in purpose to the ERD. The class diagram, Figure 6 below, is a static model that shows the classes and the relationships among classes that remain constant in the system over time (it (Dennis et al. 2002).

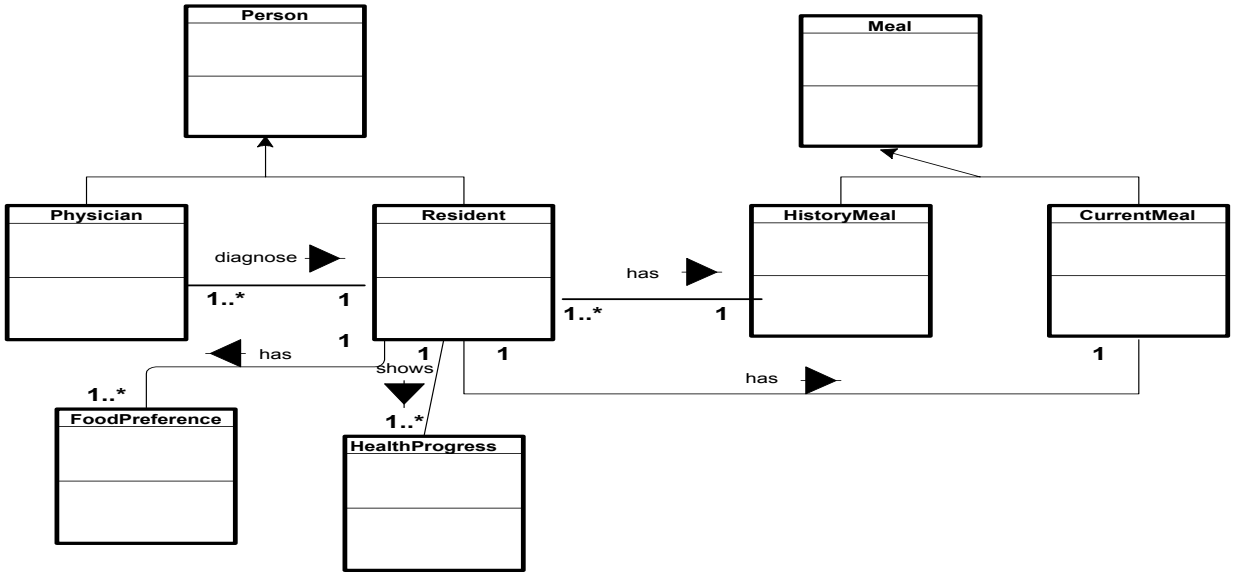

Figure 6, The Class Diagram for ***myDiet***

Eventually, in our system, each entity had been translated into a database table. The primary key and the Foreign key for each table were identified. Additionally, in order to avoid any updating anomalous behavior (O'Neil, 1994) of these tables, we had to make sure that the tables are

normalized in the third normal form (3NF) using the tests described in (Ramakrishnan, 1997; Ricardo, 1990). Those tables will not been shown, however, due to space limitations.

Forms and Reports

In order to supply the system with the right information then receive the desired outcome, we have designed a number of forms and reports, a sample of which is shown in Appendix A, after extensive discussions with the end users. These forms and reports respectively are:
New Resident Information, Admission Information, Initial Diagnosis for Admission, Menu Information, Security Authorization, and Diet History
Search for the Resident Location, Food Types, Residents' Summary List, Occupancy Summary Report, Food Ticket, and Periodic Resident's Health Analysis

System Construction

After completing all the design work, our next task was to construct the system in order to produce fully functional software, which meets users' requirements. During this step, we performed the following tasks:

1. Developing then testing all the programs using VB 6.0.
2. Creating the database and assigning the required access permissions for the different users.
3. Installing the network and the networking operating system then establishing all the links to all nurse stations and dietary office.
4. Documenting the various aspects of the system such as operation and trouble shooting.
5. Conducting the acceptance testing in order to verify that the system meets users' requirements.
6. Training end users to perform the various functions of the system.

Conversion

Our final step is to implement the system and put it into a full operation mode. We have chosen the parallel conversion approach (Whitten et al., 2001). In this approach, both the old and new systems are operated in parallel for a certain period of time in order to ensure that all business operations are gracefully carried out using the old system in case of an unexpected problem arises in the new system in spite of our extensive testing.

CONCLUSION

The system, that we have developed, will have a considerable impact on the organization from multiple points of view by creating a new dynamic and modifying exiting organizational relationships.

1. Residents, which are the most valuable assets of the organization, appreciate the fast response to their change request in diet without any errors or excuses. This will boost the satisfaction of residents and their families, which will ultimately increase profitability.
2. For management, the reports generated by the system would provide them with a real-time access to information such as the number of residents, rate of housing occupancy, verifying whether the requested food is appropriate for certain resident without jeopardizing personal privacy. The system also would eliminate all errors resulted from the manual system, which may harm a resident's health and end up with a legal liability. Another direct impact of the error-free operations is the great drop in the amount of wasted food.

3. The system will enable physicians and nurses to quickly communicate with each other, access resident's health information, analyze their progress, and reach prompt and informed diet decisions. Nurses would be able to communicate much faster with the dietary unit to verify that the right meal is prepared and ready to be delivered.
4. Finally, employees view the system as a tool to help them perform in a better, professional, and free of errors fashion. This will result in a more confident and enthusiastic attitude toward their jobs. Workers specifically would appreciate the clearness and simplicity of the food ticket generated by the system.

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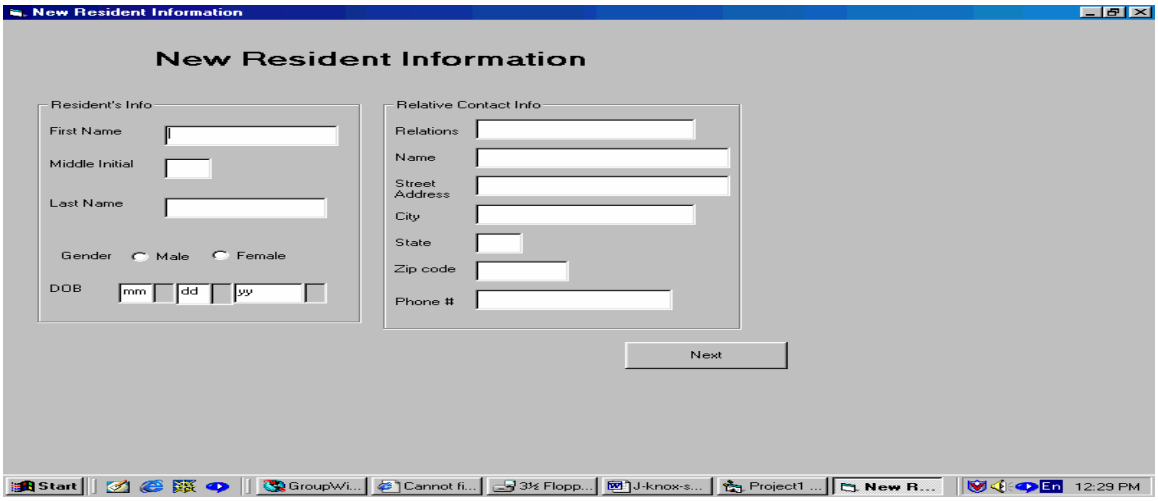
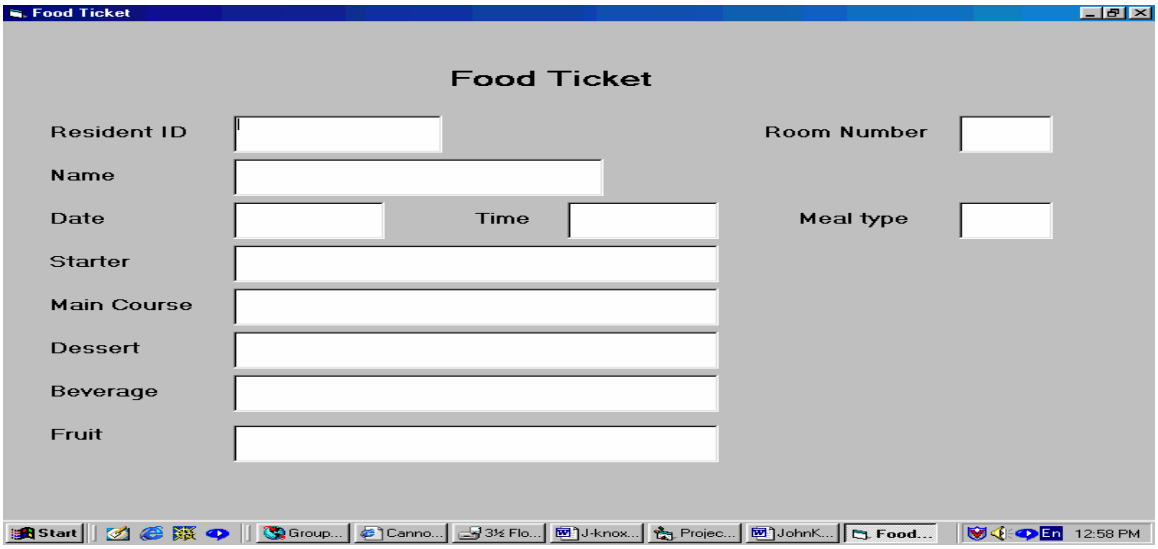
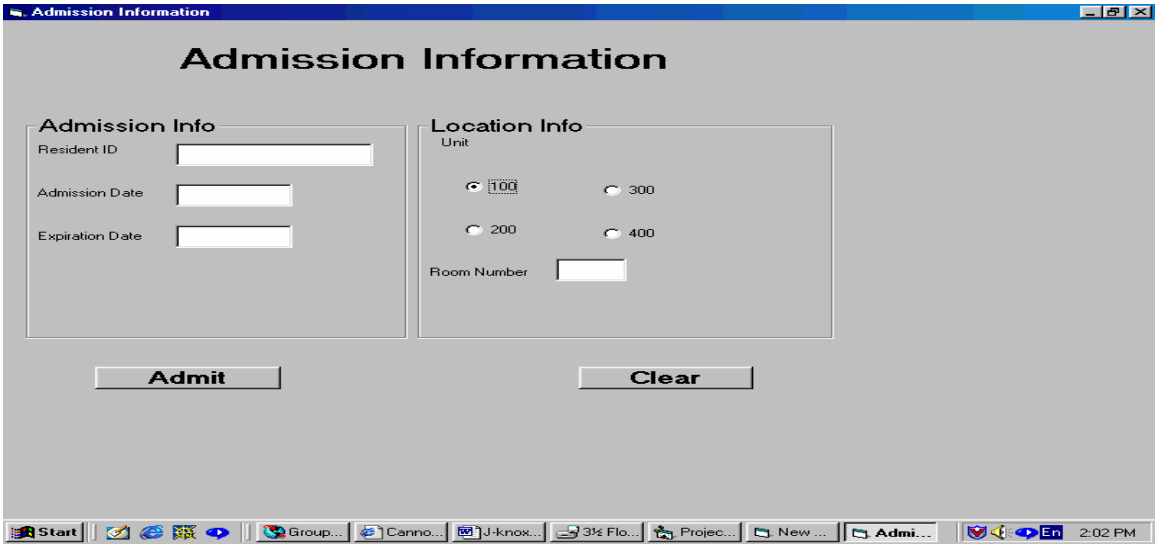
APPENDIX A

Sample reports and forms




Food Ticket
Food Ticket
Resident ID
Room Number
Name
Date
Time
Meal type
Starter
Main Course
Dessert
Beverage
Fruit
Start
12:58 PM


Admission Information
Admission Information
Admission Info
Resident ID
Admission Date
Expiration Date
Location Info
Unit
100
300
200
400
Room Number
Admit
Clear
Start
2:02 PM