Background

The California Department of Transportation (Caltrans) currently receives an extremely large, exhaustive monthly phone and data bill from Calnet, a collaboration of Pacific Bell (then SBC, now AT&T) and Worldcom (then MCI, now Verizon Business). The bills were so large and complex that they went mostly unchecked, leaving taxpayers with the erroneous charges.

About a year ago, Loragen delivered a piece of software called Bill Analyzer that allowed basic analysis of the phone bill (delivered from Calnet in a FoxPro database format), resulting in savings of millions of dollars. Caltrans is interested in expanding Bill Analyzer to add accountability for each charge and more advanced analysis features. This will be Bill Analyzer II which we will be creating. Bill Analyzer II has the potential for being used by 458 state agencies that pay Calnet for phone and data services and saving California tax payers millions of dollars.

Problems with Bill Analyzer.

For the user who only cares about basic functionality, the existing bill analyzer performs well enough. It can import bills, compile some statistics, print reports, and doesn't crash too terribly often. However, not everything works as well as one would expect. The navigation is terribly awkward, and trying to get specific information about a bill is an exercise in futility. To add insult to injury, the splash screen has yellow text on a grey background. It does not take a degree in color theory in order to know that's wrong.

Figure 1: Bill Analyzer Bill Summary   Figure 2: Bill Analyzer Investigate Window

Here we have the "Bill Summary" window. It offers a great deal of useful data, but look at the bottom. There's a "Compute Bill Summary" button. When this window loads, the text boxes are blank. If a user wants the summary, he has to press the button, even though seeing the summary is the *only* thing one can do from this page. It's a completely unnecessary step.

The investigation screen is little better. While it does give a great deal of valuable information without

unnecessary navigation, it is not searchable. Even worse, a reasonable user would expect to be able to sort the entries by clicking on any of the column headers. That reasonable user would be disappointed. There is no way to sort data in this application, or filter the data to a desired subset.

The reports (not pictured here) demonstrate another failure. There are two types: manager reports, which give summary information on a billing number; and user reports, which give detailed information on a specific charge. However, these documents are highly complementary; the user report provides detailed information about entries in the manager report. When a user sees a manager report item that he wants to investigate further, he must copy down the billing number, and manually get a user report for that number. It's an extremely awkward navigation for a very common task.

Bill Analyzer may have been a perfectly acceptable application 20 years ago. Today, barebones functionality with no thought given to user interaction is completely unacceptable.

Bill Analyzer and Duckbill Analysis

Our team did an analysis for both Bill Analyzer and DuckBill. The following questions were part the questionnaire we used for the analysis. We answered the questions with score of 1 meaning "impossible" or also if it seemed impossible (meaning the evaluator couldn't figure out how to do the task) and 5 meaning "very easy." For 10 tasks, we answered these 2 questions:
    a) How easy (1-5) is it to navigate to this task?
    b) How easy (1-5) is it to complete this task?

The 10 tasks were:
    1) Identify a specific charge.
    2) View Bill for a specific month/year with a specific label.
    3) View specific, filtered information based on bill data.
    4) Mark a charge as admissible or inadmissible.
    5) Identify all charges in a bill that have had large changes since last month.
    6) Identify all charges in a bill that are new.
    7) Import a bill from the CD.
    8) Assign a label to a CD or bill.
    9) Print a report.
       (Question 9c also asks: How easy is it to navigate from a manager to a user report?)
    10) Assign responsibility for a line to an employee.

The results of the analysis are shown in Figure 3 and Figure 4.
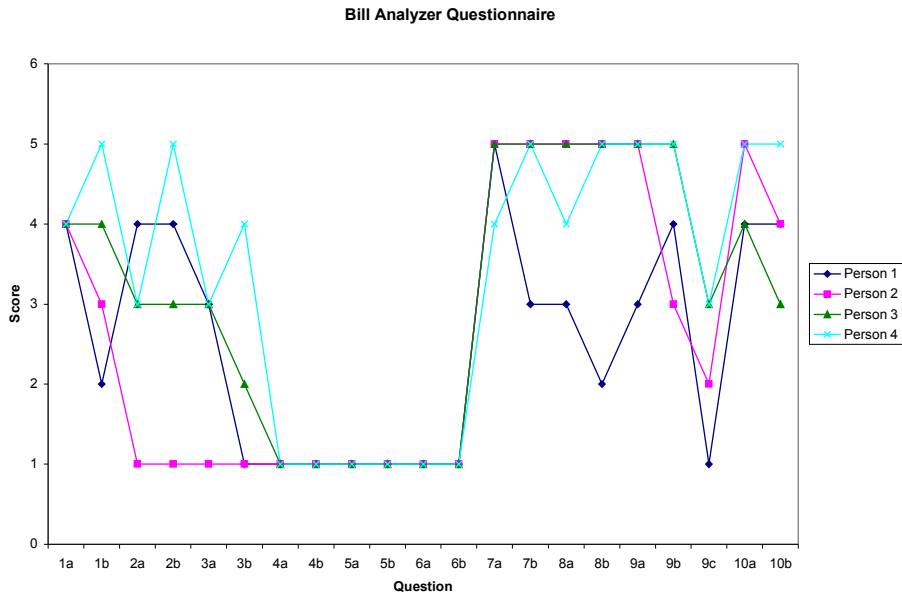
Bill Analyzer Questionnaire

Figure 3: Bill Analyzer Questionaire Results

The scores varied greatly for Bill Analyzer. Each line represents a different person out of the four on our team. Because of the lack of functionality, some of the functions it can perform were fairly easy to accomplish. There was a decent amount of useful functionality that couldn't be done, as well as some tasks which could be done that some evaluators couldn't figure out how to do. These are the tasks that one person scored a 1 where the others did not. DuckBill's results were much different.
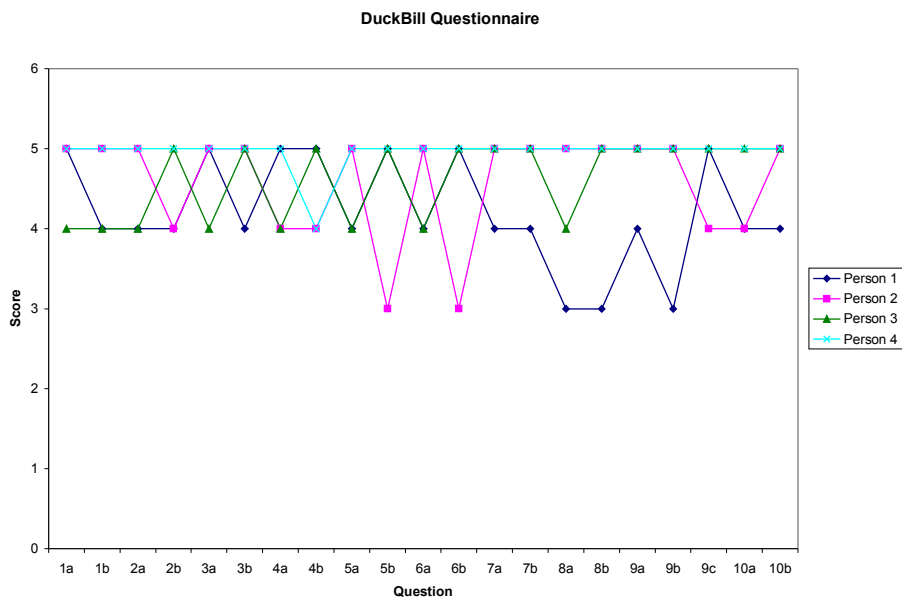
DuckBill Questionnaire

Figure 4: DuckBill Questionaire Results

We found almost every task was easy to accomplish with DuckBill, but maybe a few could have been easier. This is somewhat biased because we took part in the design of DuckBill, but from our data gathering from other people and the UI design concepts we have learned, I'm sure most people would agree the tasks are relatively easy to accomplish with DuckBill.

How DuckBill's Features Solve Bill Analyzer's Shortcomings

Bill Analyzer is a fairly powerful tool, but it's awkward interface and lack of functionality that relates to the actual business structure of Caltrans makes it unable to fulfill all of Caltrans' needs. Here are some of the major issues with Bill Analyzer:

- Not searchable.
- Not sortable.
- Can't mark charges as admissible or inadmissible.
- Can't identify charges in a bill that changed a lot since the previous month.
- Cant identify new charges in a bill.

- Can't identify a charge by date.
- Can't identify a charge by responsible user.
- Can't identify a charge by district.
- Can't find all charges associated with an employee ID.
- Can't view only desired data fields .

DuckBill solves all of these issues in a variety of robust ways. As you can see in Figure 5, DuckBill's Analyze Bill screen is much more interactive than Bill Analyzer's.

Figure 5: DuckBill Bill Analysis Panel

On this screen, the user can very easily identify the following features of the bill:

1. The **date** and **district** of the visible bill is clearly shown in the upper-left corner.
2. **New charges** are highlighted in light blue in the figure. All highlighting colors are customizable in the Highlighting panel in the lower left corner.
3. Charges with a **large change** since the previous month are highlighted in a darker blue.
4. **Unassigned charges** are highlighted red.
5. The **responsible user** for each charge is listed in the User column of the Charges table.
6. The Charges table can be **sorted** by clicking any of the column headers, and it can be **searched**, using a live regular expressions filter, by typing into the Filter field.
7. The user can **select which columns he/she wants to see** in the Charges table by manipulating the check boxes in the Visible Columns panel.

As you can see, DuckBill fulfills all of Caltrans' needs Bill Analysis features. Figure 6 below shows the Manage Users and Responsibilities screen, which administrators (users of DuckBill) can use to assign users to particular managers, and assign lines to users to mark them as responsible for the charges on that line.
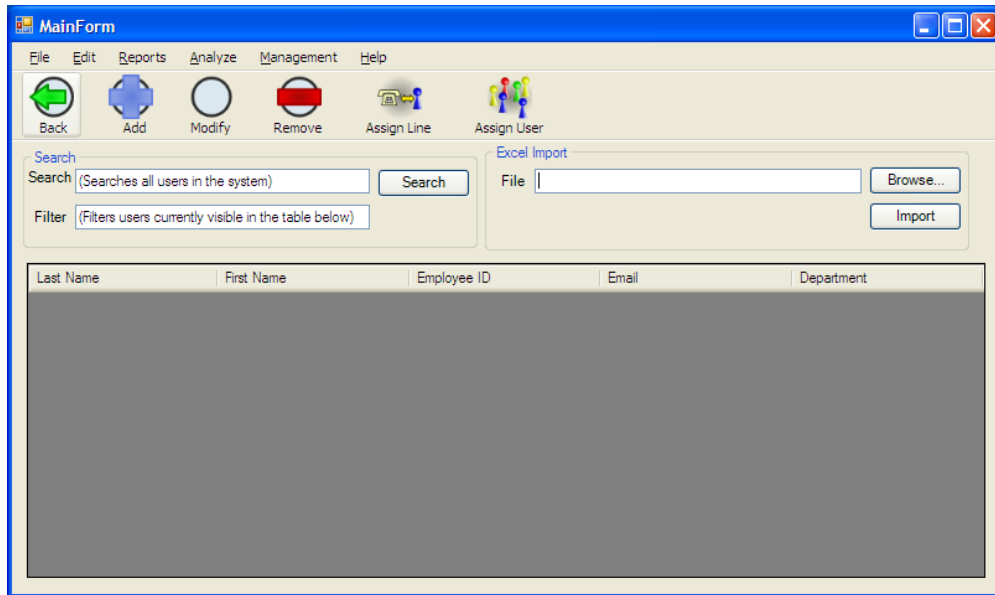

Figure 6: User Management Panel

Administrators can press the "Add" button to add a new user to the database, as seen in Figure 7. When an admin presses the Assign User button, those users will show up in the left-side life of the Assign User to Manager Dialog, where administrators can select a manager from the drop-down list in the upper-left and then select users and press the ">" button to assign the selected users to the displayed manager.
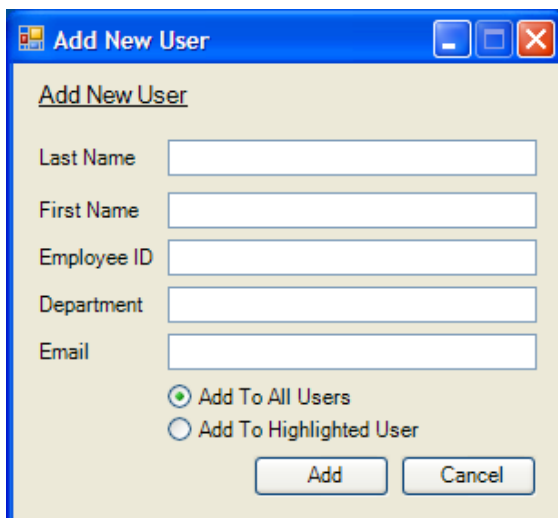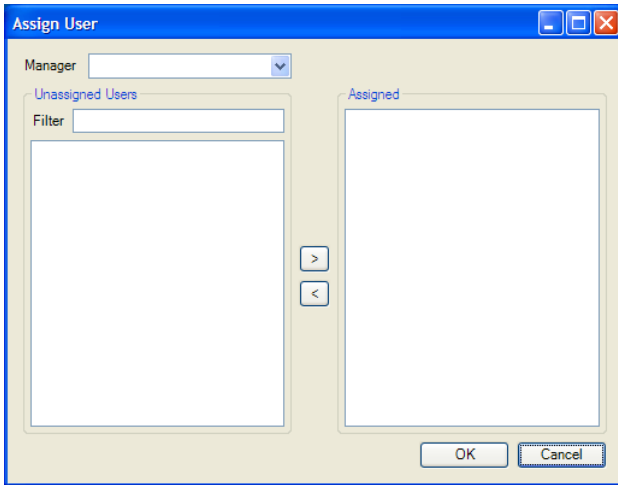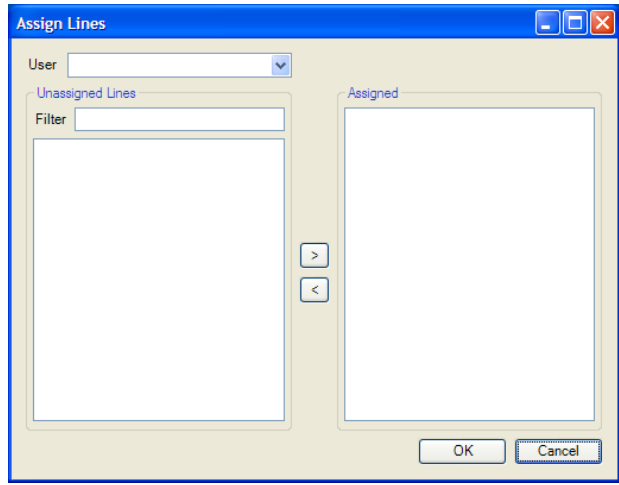

Figure 7: Add User Dialog

Figure 8: Assign User to Manager Dialog

Figure 9: Assign Line To User Dialog

In order to assign responsibility for a particular line to a user, administrators can press the Assign Line button from Figure 6 to open the dialog displayed in Figure 9: the Assign Line to User Dialog. This dialog functions in much the same way as the Assign User to Manager Dialog, but it allows administrators to choose a user form the dropdown list, and select lines from the left-side list, which can be assigned to the displayed user by pressing the ">" button.