

Coursework Title

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Chapter 1

Analysis

1.1 Introduction

My chosen client is Michael Seamark; He is fairly experienced with working with computer systems and mainly uses a laptop to assist with his job and to surf the internet. However, he also uses an iPhone to check his emails and keep in contact with people through social networking sites.

1.1.1 Define the current system

Michael has requested that I produce a metering system which monitors gas, water and electricity consumption with several graphical outputs to represent the use and any possible savings with a way to convert between units. It should be able indicate the current cost for the consumption and predict future costs. Currently, Michael relies on the monthly bills to give him the information on his consumption of electricity, gas and water and then he has to work out any savings, calculate future costs and convert to other units if needed manually.

1.1.2 Describe the problems

One problem with the current system that Michael is using is that he cannot get the consumption of gas or electricity until the end of the month which means that he cannot check the cost of what he has used until the end of the month in which case the cost could have gone up significantly. In addition to that, the method he has to work out current spendings and future savings is inefficient and more prone to mistakes because he is calculating it manually and therefore can get values wrong or misread values from the bill

1.1.3 Section appendix

Client Interview

1. What is the proposed system required to do? It needs to monitor energy used, you want it to monitor gas electricity accurately and be able to display the raw data in various ways eg charts so consumer can see easily what energy is being used. It will also need to calculate an average consumption for each month, 6 months and year and be able to cope with varying amounts of raw data stored in multiple units and calculate an average cost per month to calculate future costs based on the recent price and average consumption
2. What are the problems with the current way of doing things? The current system only monitors gas and electricity consumption and prices per month but not water and can only do one at a time so is inefficient. It is also not possible to get a reading before the month is over
3. What data is currently recorded? Currently only monthly gas and electricity consumption and averages for the consumption and price per month
4. What data will the proposed system need to record? The proposed system will need to take data on the amount of gas, electricity and water consumed per month and store. In addition to this the system will need to store averages of each for up to the past year along with prices for each month, 6 months and year and an average price for the past few months so that a prediction can be made on the cost for the coming month
5. How will the data be received? The consumption will be taken in real time and incremented onto the use for the month and the data will be stored onto a database and each month a new count will be taken along with an average price per unit of gas, electricity and water respectively
6. What processes are performed by the current system? The processes done by the current system are gathering daily electricity and gas consumption and adding it onto the monthly tallies, calculating a price for the past month based on the average cost per unit, calculate an average price of the past few months and calculate a predicted price for the next month
7. What processes will the new system be required to do? The new system will need to be able to gather daily electricity, gas and water consumption and increment it onto the monthly tallies for each one, calculate a current price of each based on the average price per unit, calculate an average price of each for the past few months, calculate the average consumption for the past few months and calculate a predicted price for the next month based on average monthly consumption on each for the past few months and average price for the past few months
8. What algorithms do these processes use? The current price will use an

algorithm which takes the current average cost per unit for gas, electricity and water and multiply the costs by their current consumption values for each. The average consumption will use an algorithm which calculates the sum of gas consumption for the past few months, the electricity consumption for the past few months and water consumption for the past few months and divide those sums by how many months the average taken data from. The average price will use an algorithm similar to the one for the average consumption but it will use values for the prices of each for the past few months rather than consumption

9. Which processes should be executed manually? All processes should be automated rather than be done manually
10. What are the inputs to the current system? The current system takes inputs for consumption for gas and electricity each day and average unit prices
11. What inputs are required for the proposed system? The proposed system will need to take inputs for gas, electricity and water consumption in real time and average unit prices
12. What are the outputs from the current system? The current system outputs an average consumption for gas and electricity for the past few months, a price for the past month for each, an average price for the past few months for each and a predicted price for the next month for each
13. What outputs will be required from the proposed system? The proposed system will output average consumptions for gas, electricity and water over the past few months, a price for the past month for gas, electricity and water, average costs for gas, electricity and water over the past few months, a predicted price for the following month for gas, electricity and water

1.2 Investigation

1.2.1 The current system

Data sources and destinations

Source	Data	Example Data	Destination
Bill	Gas consumption data	Gas consumption for past month	Notebook
Bill	Electricity consumption data	Electricity consumption for past month	Notebook
Bill	Average price per unit for gas	1.18/kWh	Notebook
Bill	Average price per unit for electricity	1.34/kWh	Notebook

Algorithms

Algorithm 1 monthly consumption algorithm for electricity

- 1: **RECEIVE** *total_electricity_consumption* **FROM** **KEYBOARD**
 - 2: **RECEIVE** *electricity_consumption* **FROM** **KEYBOARD**
 - 3: **SET** *total_electricity_consumption* **TO** *total_electricity_consumption* +
electricity_consumption
 - 4: **SEND** "*total_electricity_consumption*" **TO** **DISPLAY**
-

Algorithm 2 monthly consumption algorithm for gas

- 1: **RECEIVE** *total_gas_consumption* **FROM** **KEYBOARD**
 - 2: **RECEIVE** *gas_consumption* **FROM** **KEYBOARD**
 - 3: **SET** *total_gas_consumption* **TO** *total_gas_consumption* +
gas_consumption
 - 4: **SEND** "*total_gas_consumption*" **TO** **DISPLAY**
-

Algorithm 3 Price of gas consumption for the past month

SET *gas_price* **TO** 0
RECEIVE *total_gas_consumption* **FROM** **KEYBOARD**
RECEIVE *average_price_per_unit* **FROM** **KEYBOARD**
SET *gas_price* **TO** *total_gas_consumption* * *average_price_per_unit*
SEND *gas_price* **TO** **DISPLAY**

Algorithm 4 Price of electricity consumption for the past month

SET *electricity_price* **TO** 0
RECEIVE *total_electricity_consumption* **FROM** **KEYBOARD**
RECEIVE *average_price_per_unit* **FROM** **KEYBOARD**
SET *electricity_price* **TO** *total_electricity_consumption* *
average_price_per_unit
SEND *electricity_price* **TO** **DISPLAY**

Algorithm 5 Average price of gas consumption for the past few months

```
SET average_monthly_price TO 0
SET total_price TO 0
SEND "How many months would you like to get an average for?" TO
DISPLAY
RECEIVE amount_of_months FROM KEYBOARD
FOR EACH count IN amount_of_months DO
    RECEIVE gas_price FROM KEYBOARD
    SET total_price TO total_price + gas_price
END FOR
SET average_monthly_price TO total_price/amount_of_months
SEND average_monthly_price TO DISPLAY
```

Algorithm 6 Average gas consumption for the past few months

```
SET average_monthly_consumption TO 0
SET total_consumption TO 0
SEND "How many months would you like to get an average for?" TO
DISPLAY
RECEIVE amount_of_months FROM KEYBOARD
FOR EACH count IN amount_of_months DO
    RECEIVE gas_consumption FROM KEYBOARD
    SET total_consumption TO total_consumption + gas_consumption
END FOR
SET average_monthly_consumption TO total_consumption/amount_of_months
SEND average_monthly_price TO DISPLAY
```

Algorithm 7 Average price of electricity consumption for the past few months

```
SET average_monthly_price TO 0
SET total_price TO 0
SEND "How many months would you like to get an average for?" TO
DISPLAY
RECEIVE amount_of_months FROM KEYBOARD
FOR EACH count IN amount_of_months DO
    RECEIVE electricity_price FROM KEYBOARD
    SET total_price TO total_price + electricity_price
END FOR
SET average_monthly_price TO total_price/amount_of_months
SEND average_monthly_price TO DISPLAY
```

Algorithm 8 Average electricity consumption for the past few months

```
SET average_monthly_consumption TO 0
SET total_consumption TO 0
SEND "How many months would you like to get an average for?" TO
DISPLAY
RECEIVE amount_of_months FROM KEYBOARD
FOR EACH count IN amount_of_months DO
    RECEIVE electricity_consumption FROM KEYBOARD
    SET      total_consumption      TO      total_consumption      +
electricity_consumption
END FOR
SET average_monthly_consumption TO total_consumption/amount_of_months
SEND average_monthly_price TO DISPLAY
```

Algorithm 9 Predicted gas consumption price for the coming months

```
SET predicted_cost TO 0
RECEIVE average_gas_consumption FROM KEYBOARD
RECEIVE average_cost_per_unit FROM KEYBOARD
SET predicted_cost TO average_gas_consumption * average_cost_per_unit
SEND predicted_cost TO DISPLAY
```

Algorithm 10 Predicted electricity consumption price for the coming months

```
SET predicted_cost TO 0
RECEIVE average_electricity_consumption FROM KEYBOARD
RECEIVE average_cost_per_unit FROM KEYBOARD
SET      predicted_cost      TO      average_electricity_consumption *
average_cost_per_unit
SEND predicted_cost TO DISPLAY
```

Data flow diagram

Figure 1.1: The result of executing the print() function

Input Forms, Output Forms, Report Formats

1.2.2 The proposed system

Data sources and destinations

Data flow diagram

Data dictionary

Volumetrics

1.3 Objectives

1.3.1 General Objectives

1.3.2 Specific Objectives

1.3.3 Core Objectives

1.3.4 Other Objectives

1.4 ER Diagrams and Descriptions

1.4.1 ER Diagram

1.4.2 Entity Descriptions

1.5 Object Analysis

1.5.1 Object Listing

1.5.2 Relationship diagrams

1.5.3 Class definitions

1.6 Other Abstractions and Graphs

1.7 Constraints

1.7.1 Hardware

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1.7.2 Software

1.7.3 Time

1.7.4 User Knowledge

1.7.5 Access restrictions

Chapter 2

Design

2.1 Overall System Design

2.1.1 Short description of the main parts of the system

2.1.2 System flowcharts showing an overview of the complete system

2.2 User Interface Designs

2.3 Program Structure

2.3.1 Top-down design structure charts

2.3.2 Algorithms in pseudo-code for each data transformation process

2.3.3 Object Diagrams

2.3.4 Class Definitions

2.4 Prototyping

2.5 Definition of Data Requirements

2.5.1 Identification of all data input items

2.5.2 Identification of all data output items

2.5.3 Explanation of how data output items are generated

2.5.4 Data Dictionary

2.5.5 Identification of appropriate storage media

2.9.1 Outline Plan

Test Series	Purpose of Test Series	Testing Strategy	Strategy Rationale
Example	Example	Example	Example

2.9.2 Detailed Plan

Test Series	Purpose of Test	Test Description	Test Data	Test Data Type (Normal/Erroneous/Boundary)	Expected Result	Actual Result	Evidence
Example	Example	Example	Example	Example	Example	Example	Example

Chapter 3

Testing

3.1 Test Plan

3.1.1 Original Outline Plan

Test Series	Purpose of Test Series	Testing Strategy	Strategy Rationale
Example	Example	Example	Example

3.1.2 Changes to Outline Plan

Test Series	Purpose of Test Series	Testing Strategy	Strategy Rationale
Example	Example	Example	Example

3.1.3 Original Detailed Plan

Test Series	Purpose of Test	Test Description	Test Data	Test Data Type (Normal/Erroneous/Boundary)	Expected Result	Actual Result	Evidence
Example	Example	Example	Example	Example	Example	Example	Example

3.1.4 Changes to Detailed Plan

Test Series	Purpose of Test	Test Description	Test Data	Test Data Type (Normal/Erroneous/Boundary)	Expected Result	Actual Result	Evidence
Example	Example	Example	Example	Example	Example	Example	Example

3.2 Test Data

3.2.1 Original Test Data

3.2.2 Changes to Test Data

3.3 Annotated Samples

3.3.1 Actual Results

3.3.2 Evidence

3.4 Evaluation

3.4.1 Approach to Testing

3.4.2 Problems Encountered

3.4.3 Strengths of Testing

3.4.4 Weaknesses of Testing

3.4.5 Reliability of Application

3.4.6 Robustness of Application

Chapter 4

System Maintenance

4.1 Environment

4.1.1 Software

4.1.2 Usage Explanation

4.1.3 Features Used

4.2 System Overview

4.2.1 System Component

4.3 Code Structure

4.3.1 Particular Code Section

4.4 Variable Listing

4.5 System Evidence

4.5.1 User Interface

4.5.2 ER Diagram

4.5.3 Database Table Views

4.5.4 Database SQL 21

4.5.5 SQL Queries

4.6 Testing

4.6.1 Screenshots of Results

4.10.1 Module 1

Chapter 5

User Manual

5.1 Introduction

5.2 Installation

5.2.1 Prerequisite Installation

Installing Python

Installing PyQt

Etc.

5.2.2 System Installation

5.2.3 Running the System

5.3 Tutorial

5.3.1 Introduction

5.3.2 Assumptions

5.3.3 Tutorial Questions

Question 1

Question 2

5.3.4 Saving

5.3.5 Limitations

5.4 Error Recovery

5.4.1 Error 1

Chapter 6

Evaluation

6.1 Customer Requirements

6.1.1 Objective Evaluation

6.2 Effectiveness

6.2.1 Objective Evaluation

6.3 Learnability

6.4 Usability

6.5 Maintainability

6.6 Suggestions for Improvement

6.7 End User Evidence

6.7.1 Questionnaires

6.7.2 Graphs

6.7.3 Written Statements