

APPENDIX A - QUESTIONNAIRE

A Survey On The Preferences of Mobile Phone Users Towards Mobile Phone Features

Objective:

This survey is conducted to gather information on the preference of the mobile phone users towards mobile phones features in Malaysia.

Instructions:

Please tick only one box for all questions except questions no. 5- no. 11 where you may tick more than one box (if applicable) and/or specify otherwise.

Note:

If you do not own a mobile phone, please rate the following questions according to the type of mobile phones that you would like to purchase in the future.

Due date: 30th January 2002

1. Gender group:

☐ Male

☐ Female

2. Age group:

☐ < 20 years old

☐ 20 - 25 years old

☐ 26 - 30 years old

☐ > 30 years old

3. Occupation category:

☐ University student

☐ Finance sector

☐ Information technology (IT) sector

4. Do you own a mobile phone?

☐ Yes

☐ No







If **yes**, when did you purchase your first mobile phone?

Year _____ (Please state approximate year if unable to remember the exact year.)

You may tick **more than one** box for questions no 5 – no 12.

If the answer to **question 4** is **no**, please proceed to **question 6**.

5. Which type of mobile phone have you used before?

| Year Manufactured | 1987-1988 | 1989 - 1990 | 1991-1992 | 1993-1994 | 1995-1997 | 1998->> |
|----------------------|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| | A | B | C | D | E | F |
| | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

6. What type of **physical attributes** of a mobile phone do you prefer?
☐ Compact design ☐ Light weighted
☐ Large high quality display screen ☐ Others, please specify: _____
7. What type of **durability features** do you need in a mobile phone?
☐ Shock resistance ☐ Water resistance
☐ Dirt and dust resistance ☐ Others, please specify: _____
8. What type of **security features** do you need in a mobile phone?
☐ Call management ☐ Call control
☐ Phone lock and key lock ☐ Restrict access to phone directories
☐ Others, please specify: _____
9. What type of **entertainment features** do you wish to have in a mobile phone?
☐ Games ☐ Animated icon messaging
☐ Animated icon & ring tone profiling ☐ Downloadable animated screen savers
☐ Downloadable ring tone ☐ Others, please specify: _____
10. What type of **accessibility features** do you wish to have in a mobile phone?
☐ Predictive text entry system ☐ Quick access key
☐ Voice recognition ☐ Visual alert indicator
☐ Voice note function ☐ Others, please specify: _____
11. What other types of **wireless solution** do you normally wish to have?
☐ None ☐ Bluetooth
☐ Mobile Internet Service ☐ High Speed Circuit Switched Data
☐ Infrared connectivity ☐ Short Messaging Services (SMS)
☐ Dual band functionality ☐ Global Packet Radio Service (GPRS)
☐ Others, please specify: _____

You may tick **only one** box for question no 12.

12. From the above questions, which **feature** do you need most in a mobile phone when purchasing your first mobile phone?
☐ Physical attribute ☐ Durability
☐ Security ☐ Entertainment
☐ Accessibility ☐ Wireless solution
☐ Others, please specify: _____

13. Other comments related to issues beside those questions asked in this questionnaire (if any).

Thank you for your kind participation.

APPENDIX B – REGRESSION RESULTS OF THE MOBILE PHONES FEATURES AND NUMBER OF SUBSCRIBERS

1.1 SPSS LINEAR REGRESSION RESULTS

Tables B1.1 –B1.12 are the linear regression results for each mobile phone feature.

i. Linear Regression Model for Physical Attributes and Number of Subscribers

Table B1.1: Model Summary for Physical Attributes

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .983 | .967 | .964 | 309575.424 |

Table B1.2: Coefficients for Physical Attributes

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 43093.613 | 128521.704 | |
| Physical Attributes | 247468.285 | 15184.822 | .983 |

ii. Linear Regression Model for Durability and Number of Subscribers

Table B1.3: Model Summary for Durability

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .926 | .857 | .841 | 646085.998 |

Table B1.4: Coefficients for Durability

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|------------|-----------------------------|----------------|---------------------------|
| Constant | -994160.594 | 389207.425 | |
| Durability | 344908.437 | 46916.923 | .926 |

iii. Linear Regression Model for Security and Number of Subscribers

Table B1.5: Model Summary for Security

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .904 | .817 | .796 | 732363.003 |

Table B1.6: Coefficients for Security

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|----------|-----------------------------|----------------|---------------------------|
| Constant | -479469.228 | 380626.344 | |
| Security | 218042.035 | 34447.458 | .904 |

iv. Linear Regression Model for Entertainment and Number of Subscribers

Table B1.7: Model Summary for Entertainment

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .976 | .953 | .948 | 370809.437 |

Table B1.8: Coefficients for Entertainment

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | -208774.059 | 167899.680 | |
| Entertainment | 310141.911 | 22964.529 | .976 |

v. Linear Regression Model for Accessibility and Number of Subscribers

Table B1.9: Model Summary for Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .884 | .781 | .756 | 1474446.05 |

Table B1.10: Coefficients for Accessibility

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | -1569176.108 | 590859.209 | |
| Accessibility | 373032.635 | 65910.441 | .884 |

vi. Linear Regression Model for Wireless Solution and Number of Subscribers

Table B1.11: Model Summary for Wireless Solution

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .975 | .950 | .944 | 382620.887 |

Table B1.12: Coefficients for Wireless Solution

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|-------------------|-----------------------------|----------------|---------------------------|
| Constant | 52321.134 | 159041.691 | |
| Wireless Solution | 130053.451 | 9952.483 | .975 |

1.2 SPSS MULTIPLE REGRESSION RESULTS

Tables B2.1 – B2.30 are the multiple regression results generated by SPSS.

- i. Multiple Regression Model for Physical Attributes, Durability and Number of Subscribers

Table B2.1: Model Summary for Physical Attributes and Durability

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .990 | .981 | .976 | 251530.299 |

Table B2.2: Coefficients for Physical Attributes and Durability

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 645225.341 | 274348.651 | |
| Physical Attributes | 364579.857 | 50862.096 | 1.449 |
| Durability | -178716.324 | 75299.175 | -.480 |

- ii. Multiple Regression Model for Physical Attributes, Security and Number of Subscribers

Table B2.3: Model Summary of Physical Attributes and Security

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .991 | .982 | .977 | 244782.394 |

Table B2.4: Coefficients of Physical Attributes and Security

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 358219.010 | 160795.691 | |
| Physical Attributes | 345412.665 | 40549.082 | 1.373 |
| Security | -98331.512 | 38883.789 | -.408 |

- iii. Multiple Regression Model for Physical Attributes, Entertainment and Number of Subscribers

Table B2.5: Model Summary for Physical Attributes and Entertainment

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .983 | .967 | .959 | 328281.327 |

Table B2.6: Coefficients of Physical Attributes and Entertainment

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 52153.398 | 204065.273 | |
| Physical Attributes | 255580.583 | 136948.459 | 1.016 |
| Entertainment | -10314.078 | 172910.230 | -.032 |

- iv. Multiple Regression Model for Physical Attributes, Entertainment and Number of Subscribers

Table B2.7: Model Summary for Physical Attributes and Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .990 | .980 | .975 | 257313.219 |

Table B2.8: Coefficients for Physical Attributes and Accessibility

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 718419.972 | 319579.506 | |
| Physical Attributes | 324062.808 | 36418.300 | 1.288 |
| Accessibility | -137007.105 | 61105.425 | -.325 |

- v. Multiple Regression Model for Physical Attributes, Wireless Solution and Number of Subscribers

Table B2.9: Model Summary for Physical Attributes and Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .983 | .967 | .959 | 328323.834 |

Table B2.10: Coefficients for Physical Attributes and Accessibility

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------------|-----------------------------|----------------|---------------------------|
| Constant | 43403.034 | 136541.350 | |
| Physical Attributes | 252157.332 | 122705.796 | 1.002 |
| Wireless Solution | -2508.286 | 65070.572 | -.019 |

- vi. Multiple Regression Model for Durability, Security and Number of Subscribers

Table B2.11: Model Summary for Durability and Security

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .931 | .867 | .834 | 661791.387 |

Table B2.12: Coefficients for Durability and Security

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|------------|-----------------------------|----------------|---------------------------|
| Constant | -1335905.807 | 600857.893 | |
| Durability | 608488.521 | 350040.679 | 1.633 |
| Security | -172359.892 | 226730.586 | -.714 |

- vii. Multiple Regression Model for Durability, Entertainment and Number of Subscribers

Table B2.13: Model Summary for Durability and Entertainment

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .979 | .958 | .948 | 370570.062 |

Table B2.14: Coefficients for Durability and Entertainment

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | 77492.680 | 330394.260 | |
| Durability | -106735.960 | 106120.593 | -.287 |
| Entertainment | 398195.356 | 90503.890 | 1.253 |

- viii. Multiple Regression Model for Durability, Accessibility and Number of Subscribers.

Table B2.15: Model Summary for Durability and Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .939 | .881 | .851 | 625930.859 |

Table B2.16: Coefficients for Durability and Accessibility

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | -285962.804 | 676628.630 | |
| Durability | 660728.727 | 254635.222 | 1.774 |
| Accessibility | -363777.540 | 288590.889 | -.862 |

- ix. Multiple Regression Model for Durability, Wireless Solution and Number of Subscribers

Table B2.17: Model Summary for Durability and Wireless Solution

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .982 | .964 | .956 | 342137.969 |

Table B2.18: Coefficients for Durability and Wireless Solution

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|-------------------|-----------------------------|----------------|---------------------------|
| Constant | 746509.568 | 410165.650 | |
| Durability | -208211.707 | 115391.722 | -.559 |
| Wireless Solution | 202885.286 | 41333.126 | 1.520 |

- x. Multiple Regression Model for Security, Entertainment and Number of Subscribers

Table B2.19: Model Summary for Security and Entertainment

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .978 | .957 | .946 | 375893.299 |

Table B2.20: Coefficients for Security and Entertainment

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | -103569.161 | 208725.652 | |
| Security | -47802.225 | 54897.933 | -.198 |
| Entertainment | 369728.018 | 72282.302 | 1.164 |

- xi. Multiple Regression Model for Security, Accessibility and Number of Subscribers

Table B2.21: Model Summary for Security and Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .908 | .825 | .781 | 759691.656 |

Table B2.22: Coefficients for Security and Accessibility

| Feature | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | 389919.708 | 1493869.139 | |
| Security | 377679.440 | 266952.793 | 1.565 |
| Accessibility | -281859.793 | 467096.934 | -.668 |

xii. Multiple Regression Model for Security, Wireless Solution and Number of Subscribers

Table B2.23: Model Summary for Security and Wireless Solution

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .986 | .972 | .965 | 301673.333 |

Table B2.24: Coefficients for Security and Wireless Solution

| | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|-------------------|-----------------------------|----------------|---------------------------|
| Constant | 491657.885 | 213354.079 | |
| Security | -140793.521 | 55317.820 | -.583 |
| Wireless Solution | 205308.445 | 30591.238 | 1.539 |

xiii. Multiple Regression Model for Entertainment, Accessibility and Number of Subscribers

Table B2.25: Model Summary for Entertainment and Accessibility

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .977 | .955 | .944 | 384556.727 |

Table B2.26: Coefficients for Entertainment and Accessibility

| | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|---------------|-----------------------------|----------------|---------------------------|
| Constant | 10451.378 | 401130.664 | |
| Entertainment | 344800.408 | 61895.805 | 1.085 |
| Accessibility | -49899.885 | 82254.142 | -.118 |

xiv. Multiple Regression Model For Entertainment, Wireless Solution and Number of Subscribers

Table B2.27: Model Summary for Entertainment and Wireless Solution

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .978 | .957 | .946 | 377052.277 |

Table B2.28: Coefficients for Entertainment and Wireless Solution

| | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|-------------------|-----------------------------|----------------|---------------------------|
| Constant | -105644.473 | 210346.305 | |
| Entertainment | 178521.121 | 158549.174 | .562 |
| Wireless Solution | 55891.091 | 66591.684 | .419 |

- xv. Multiple Regression Model For Accessibility, Wireless Solution and Number of Subscribers

Table B2.29: Model Summary for Accessibility and Wireless Solution

| R | R Square | Adjusted R Square | Standard Error of the Estimate |
|------|----------|-------------------|--------------------------------|
| .980 | .960 | .951 | 360529.098 |

Table B2.30: Coefficients for Accessibility and Wireless Solution

| | Unstandardized Coefficients | Standard Error | Standardized Coefficients |
|-------------------|-----------------------------|----------------|---------------------------|
| Constant | 686128.259 | 458756.881 | |
| Accessibility | -129160.645 | 88359.290 | -.306 |
| Wireless Solution | 168504.522 | 27926.189 | 1.263 |

APPENDIX C - REQUIREMENTS SPECIFICATION

The following section describes the requirements specification for the MPID modules.

1.1 REQUIREMENTS SPECIFICATION OF S&T FEATURE MODULE

The following section describes the requirements specification of S&T feature module.

a) View S&T Mobile Phone Preference

The function displays the S&T mobile phone features.

i) Input

This function shall accept mouse input from the selection of S&T mobile phone features from the drop down list.

ii) Process

The function shall find and display the S&T mobile phone feature description selected from the database.

iii) Output

The description for the S&T feature is displayed.

b) Add S&T Preference

The function adds new S&T mobile phone features.

i) Input

This function shall accept input of the S&T mobile phone features and its description to be added.

ii) Process

The function shall search the database for similar S&T mobile phone feature. If no similar data is found, the entered data is added to the related table in the database. A dynamic table is created for the specific S&T mobile phone feature.

iii) Output

The S&T mobile phone feature is added to the database.

c) Modify S&T Preference

The function modifies S&T mobile phone feature.

iv) Input

This function shall modify the S&T mobile phone features and its description to be modified.

v) Process

The function shall search the database for similar S&T mobile phone feature. If similar data is found, the entered data is modified.

vi) Output

The S&T mobile phone feature is modified.

d) Delete S&T Preference

The function deletes S&T mobile phone feature.

i) Input

This function shall accept input of the S&T mobile phone features to be deleted.

ii) Process

The function shall search the database for similar S&T mobile phone feature. If similar data is found, the entered data is deleted from the related table in the database. The table related to S&T mobile phone feature is deleted.

iii) Output

The S&T mobile phone feature is deleted from the database.

e) View Values of S&T Mobile Phone Features

The function allows users to view values of S&T mobile phone features in table and graphs.

i) Input

The function shall receive mouse input from the selection of S&T mobile phone features from the drop down list.

ii) Process

The function shall find the values of S&T mobile phone features selected from the database.

iii) Output

The values of S&T mobile phone features selected from the database are displayed in table and graphs.

f) Add Values of S&T Mobile Phone Features

The function adds new value of S&T mobile phone feature.

i) Input

This function shall accept input of the year and value of S&T mobile phone features to be added.

ii) Process

The function shall search the database for similar value of year. If no similar year is found, the entered data is added with the corresponding year into the related table in the database.

iii) Output

The value S&T mobile phone features are added to the database.

g) Modify Values of S&T Mobile Phone Features

The function modifies value of S&T mobile phone feature.

i) Input

This function shall accept input of the year to be modified.

ii) Process

The function shall search the database for similar value of year. If similar year is found, the corresponding value is modified.

iii) Output

The value S&T mobile phone feature is modified.

h) Delete Values of S&T Mobile Phone Features

The function deletes value of S&T mobile phone feature.

iv) Input

This function shall accept input of the year to be deleted.

v) Process

The function shall search the database for similar value of year. If similar year is found, the corresponding value is deleted from the related table in the database.

vi) Output

The value S&T mobile phone feature is deleted from the database.

1.2 REQUIREMENTS SPECIFICATION OF GROWTH OF MOBILE PHONE MODULE

The following section describes the requirements specification of growth of mobile phone module.

a) View Growth of Mobile Phone Usage

The function displays the growth of mobile phone usage module.

i) Input

This function shall accept mouse input for the period of year viewing of growth of mobile phone usage is needed from the drop down lists.

ii) Process

The function shall find and display the growth of mobile phone usage based on the selected period from the database.

iii) Output

The function shall display the growth of mobile phone usage based on the selected period.

b) Add Growth of Mobile Phone Usage

The function adds new growth of mobile phone usage module.

i) Input

This function shall accept input of the year and growth of mobile phone usage to be added.

ii) Process

The function shall search the database for similar year. If no similar data is found, the entered data is added to the related table in the database.

iii) Output

The year and growth of mobile phone usage are added to the database.

c) Modify Growth of Mobile Phone Usage

The function modifies the growth of mobile phone usage module.

iv) Input

This function shall accept input of the year and growth of mobile phone usage to be modified.

v) Process

The function shall search the database for similar year. If similar data is found, the entered data is modified.

vi) Output

The year and growth of mobile phone usage are modified.

d) Delete Growth of Mobile Phone Usage

The function deletes growth of mobile phone.

i) Input

This function shall accept input of the year to be deleted.

ii) Process

The function shall search the database for similar year. If similar data is found, the entered data is deleted from the related table in the database.

iii) Output

The year and growth of mobile phone usage are deleted from the database.

e) **Report Growth of Mobile Phone**

The function generates report of the growth of mobile phone usage.

i) **Input**

This function shall accept mouse click to redirect to the report.

ii) **Process**

The function shall open the report.

iii) **Output**

The report generated is displayed.

1.3 REQUIREMENTS SPECIFICATION OF FORECAST MODULE

The following section describes the requirements specification of forecast module.

a) **MPID Forecast**

The function generates forecast results. The data generated are displayed in tables and graphs.

i) **Input**

This function shall accept mouse input of the period of forecast and the mobile phone feature(s).

ii) **Process**

The function shall generate forecast of growth of mobile phone usage based on the selected data.

iii) **Output**

The forecast results are displayed in tables and graphs.

e) **Report Growth of Mobile Phone**

The function generates report of the growth of mobile phone usage.

i) **Input**

This function shall accept mouse click to redirect to the report.

ii) **Process**

The function shall open the report.

iii) **Output**

The report generated is displayed.

1.3 REQUIREMENTS SPECIFICATION OF FORECAST MODULE

The following section describes the requirements specification of forecast module.

a) **MPID Forecast**

The function generates forecast results. The data generated are displayed in tables and graphs.

i) **Input**

This function shall accept mouse input of the period of forecast and the mobile phone feature(s).

ii) **Process**

The function shall generate forecast of growth of mobile phone usage based on the selected data.

iii) **Output**

The forecast results are displayed in tables and graphs.

b) Regenerate Forecast

The function narrows down the range of the forecast results.

i) Input

This function shall accept mouse input for the period (years) from the drop down lists to narrow down the results displayed based on the period.

ii) Process

The function shall narrow down the range of data according to the years chosen.

iii) Output

The forecast is displayed within the period chosen in a graph form.

c) Report Forecast

The function generates report of the forecast.

i) Input

This function shall accept mouse click to redirect to the report.

ii) Process

The function shall open the report.

iii) Output

The report generated is displayed.

d) Comparison Forecast

The function generates the comparison of the forecast results.

i) Input

This function shall accept mouse input of the different features.

ii) Process

The function shall compare the forecast results based on the different features selected.

iii) Output

The comparison is displayed in a graph.

b) Regenerate Comparison Forecast

The function narrows down the range of the comparison of the forecast results.

i) Input

This function shall accept mouse input for the period (years) from the drop down lists to narrow down the range of results displayed based on the period.

ii) Process

The function shall narrow down the range of data according to the years chosen.

iii) Output

The comparison is displayed within the period chosen in a graph form.

APPENDIX D – MPID TEST PLAN AND TEST CASES

The test plan and test cases are described in the sections below.

I.1 MPID TEST PLAN

The outline of the test plan of MPID is given below:

i. Introduction

Testing is conducted to detect errors that occur in MPID.

ii. Objectives

The objective of the testing is to detect and correct errors that occur during MPID development.

iii. Testing Strategy

Six unit tests are carried out in MPID. Three module tests are carried out on the larger components. Module testing is a large proportion of the project, and as such, will take up a large part of the test plan. Integration testing will focus primarily on the communication between the modules.

iv. Test Level Plan

- Unit test (Unit test will be completed using top-down testing.).
- Module test (Module test will be completed using black-box testing.).
- Integration Test (Testing done to show the existence of integration bugs using sandwich testing. Sandwich testing combines both top-down and bottom-up testing.).

v. Environment Requirements

The test environment of MPID includes Windows 98 and Windows 2000.

vi. Test Schedule

Testing was carried out from 12-30 December 2002.

1.2 MPID TEST CASE

The following shows the unit test cases, module test cases and integration test cases for MPID.

1.2.1 MPID Unit Test Cases

The following tables show the test case for MPID S&T feature module and MPID forecast module. Tables D.1 – D.3 show the test on viewing, inserting, modifying and deleting S&T features.

Table D.1: Test Cases (Viewing S&T Features)

| S&T Feature Module – Viewing S&T Features | | | |
|---|---|---|-------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Selecting a feature from the data combo. | Displays the description of the selected feature. | |
| 2) | Entering feature not from the data combo. | Error message displayed. | |

Table D.2: Test Cases (Inserting S&T Features)

| S&T Feature Module – Inserting S&T Features | | | |
|---|---|---|-------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Key in a feature. | Insertion successful if feature does not exist in the database. | |
| 2) | Key in a feature that exists in the database. | Insertion denied. Error message displayed. | |
| 3) | No value keyed in for feature. | Insertion denied. Error message displayed. | |

Table D.3: Test Cases (Deleting S&T Features)

| S&T Feature Module – Deleting S&T Features | | | |
|---|---|--|--------------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Feature selected from combo box. | Deletion successful if feature exists in the database. | |
| 2) | Feature selected not found in database. | Deletion denied. Error message displayed. | |
| 3) | No value keyed in for feature. | Deletion denied. Error message displayed. | |

Tables D.4 – D.6 show the test on forecasting and comparison of forecasted results.

Table D.4: Test Cases (Forecasting Growth of Mobile Phone Usage)

| S&T Forecast Module – Forecasting Growth of Mobile Phone Usage | | | |
|---|--|--|--------------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Select feature(s) and year from data list. | Generates forecasting formula and results. | |
| 2) | Feature selected not found in database. | Forecasting denied. Error message displayed. | |
| 3) | No value keyed in for feature. | Forecasting denied. Error message displayed. | |
| 4) | No value keyed in for year. | Forecasting denied. Error message displayed. | |

Table D.5: Test Cases (Regenerate Forecast Based on Different Year Range)

| S&T Forecast Module – Regenerate Forecast Based on Different Year Range | | | |
|--|-----------------------------|---|--------------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Select year from data list. | Regenerate the results. | |
| 2) | Year entered not in range. | Regeneration of the forecast results denied. Error message displayed. | |
| 3) | No year selected. | Regeneration of the forecast results denied. Error message displayed. | |

Table D.6: Test Cases (Comparison of Forecasted Growth of Mobile Phone Usage)

| S&T Forecast Module – Comparison of Forecasted Growth of Mobile Phone Usage | | | |
|---|---|---|-------------|
| Case | Input | Expected Output | Pass / Fail |
| 1) | Select feature(s) and year from data list to be compared. | Generates comparison graph. | |
| 2) | Feature selected not found in database. | Comparison denied. Error message displayed. | |
| 3) | Year entered not in range. | Comparison denied. Error message displayed. | |
| 4) | No feature selected for comparison. | Comparison denied. Error message displayed. | |
| 5) | One feature selected for comparison. | Comparison denied. Error message displayed. | |
| 6) | No year selected for comparison. | Comparison denied. Error message displayed. | |

1.2.2 MPID Module Test Cases

The section shows the module test cases for MPID S&T feature module, MPID current growth of mobile phone usage module and MPID forecast module. Table D.7 displays the test on S&T feature module, whereas, Table D.8 displays the test on MPID current growth of mobile phone usage module. Table D.9 describes the test on the forecast module.

Table D.7: Test on S&T Feature Module

| Test Scenario 1 | | Pass / Fail |
|---|---|-------------|
| Test on inserting, modifying, deleting and viewing the S&T features. | | |
| Expected Results | System stores, modifies, deletes and displays the S&T features according to user's request. | |
| Actual Results | System stores, modifies, deletes and displays the S&T features according to user's request. | |
| Test Scenario 2 | | Pass / Fail |
| Test on inserting, modifying, deleting and viewing the number of respondents whose purchasing preference of mobile phone from the survey relates to each S&T feature. | | |
| Expected Results | System stores, modifies, deletes and displays the values of S&T features according to user's request. | |
| Actual Results | System stores, modifies, deletes and displays the values of S&T features according to user's request. | |

Table D.8: Test on MPID Current Growth of Mobile Phone Usage Module

| Test Scenario 1 | | Pass / Fail |
|--|---|-------------|
| Test on inserting, modifying, deleting and viewing the current growth of mobile phone usage. | | |
| Expected Results | System stores, modifies, deletes and displays the current growth of mobile phone usage according to user's request. | |
| Actual Results | System stores, modifies, deletes and displays the current growth of mobile phone usage according to user's request. | |

Table D.9: Test on MPID Forecast Module

| Test Scenario 1 | | Pass / Fail |
|---|--|-------------|
| Test on forecasting the growth of mobile phone usage. | | |
| Expected Results | System forecasts the growth of mobile phone usage based on S&T features according to user's request. | |
| Actual Results | System forecasts the growth of mobile phone usage based on S&T features according to user's request. | |
| Test Scenario 2 | | Pass / Fail |
| Test on the comparison of forecasted number of subscribers based on different S&T features. | | |
| Expected Results | System compares the forecasted growth of mobile phone usage based on different S&T features according to user's request. | |
| Actual Results | System compares the forecasted growth of mobile phone usage based on different S&T features according to the user's request. | |

1.2.3 MPID Integrated Test Cases

Table D.10 shows MPID integrated test plan.

Table D.10: MPID Integrated Test Cases

| Aesthetic conditions | Pass/Fail |
|---|-----------|
| General screen background is in the correct colour. | |
| Text fields are specified in the correct screen font. | |
| Field prompts aligned on the screen. | |
| Field edit boxes aligned on the screen. | |
| Screens are resizable. | |
| Screens are minimizable. | |
| The field prompts are spelt correctly. | |

| | |
|--|--|
| Assure that all windows have a consistent look and feel. | |
| Assure that all dialog boxes have a consistent look and feel. | |
| Validation conditions | |
| A failure of validation on every field causes a user error message. | |
| Validation consistently applied at screen level unless specifically required at field level. | |
| For all numeric fields, check whether negative numbers can be entered. | |
| Mandatory fields require user input. | |
| Navigation conditions | |
| Forms can be accessed correctly from the menu. | |
| Forms can be accessed correctly from the toolbar. | |
| Forms accessible via buttons can be accessed correctly. | |
| Data integrity conditions | |
| Check the maximum field lengths to ensure that there are no truncated characters. | |
| Check maximum and minimum field values for numeric fields. | |
| General conditions | |
| The "help" menu exists. | |
| No duplicate hot keys exist. | |
| The cancel button functions the same as the escape key. | |
| When a command button is used sometimes and not at other times, it is greyed out when it should not be used. | |
| All field labels/names are not technical labels, but rather are names meaningful to system users. | |
| Command buttons are all of similar size and shape, and same font and font size. | |
| Dropdowns on this screen sorted correctly. | |
| Date entry required in the correct format. | |
| Shortcut keys work correctly. | |
| The tab order specified on the screen goes in sequence from top left to bottom right. | |
| The cursor is positioned in the first input field or control when the screen is opened. | |
| All the field edit boxes indicate the number of characters they will hold by their length. | |

| | | | | | |
|--|---|---|---|---|---|
| 3. Instructions given are easy to understand. | 1 | 2 | 3 | 4 | 5 |
| 4. Helps in forecasting the growth of mobile phone usage. | 1 | 2 | 3 | 4 | 5 |
| 5. Helps in making business decisions in the telecommunication industry. | 1 | 2 | 3 | 4 | 5 |
| 6. MPID has all the functions and capabilities that it should have. | 1 | 2 | 3 | 4 | 5 |
| 7. Help messages on the screen are useful. | 1 | 2 | 3 | 4 | 5 |
| 8. Error messages are clear on how to fix problems quickly and easily. | 1 | 2 | 3 | 4 | 5 |
| 9. Task can be performed in a straightforward manner. | 1 | 2 | 3 | 4 | 5 |
| 10. Exploring features by trial and error was easy. | 1 | 2 | 3 | 4 | 5 |
| 11. MPID responds quickly to inputs. | 1 | 2 | 3 | 4 | 5 |
| 12. Organisation of information on the screen is very clear. | 1 | 2 | 3 | 4 | 5 |
| 13. The reports are very clear. | 1 | 2 | 3 | 4 | 5 |
| 14. Amount of information displayed on the screen is adequate. | 1 | 2 | 3 | 4 | 5 |
| 15. Screen sequence is logical. | 1 | 2 | 3 | 4 | 5 |
| 16. The wordings are clear and easy to read. | 1 | 2 | 3 | 4 | 5 |
| 17. The colour combination is suitable. | 1 | 2 | 3 | 4 | 5 |
| 18. The graphs are clear and easy to understand. | 1 | 2 | 3 | 4 | 5 |
| 19. Navigation from one screen to another is easy. | 1 | 2 | 3 | 4 | 5 |
| 20. Can exit from MPID at anytime. | 1 | 2 | 3 | 4 | 5 |

Section 3: Comments

Other comments about **MPID** (if any):

Thank you for your kind participation.

APPENDIX F - PUBLICATIONS

Paper Accepted:

1. Y.S. Koh and S.H. Ow, Growth Rate of Mobile Phone Usage in Malaysia, *will be published in the proceedings of the Public Institutions of Higher Learning (IPTA) Research & Development Exposition and Conference 2003*, Putra World Trade Centre, Kuala Lumpur, 2-5 October 2003.
2. Y.S. Koh and S.H. Ow, Mobile Phone Usage Growth Rate Indicator (MPID) Based on an Econometric Model, *will be published in the Winter International Symposium on Information and Communication Technologies WISICT04*, Cancun, Mexico, 5-8th January 2004.

Papers written and to be published in conference/journal:

1. Y.S. Koh and S.H. Ow, A Study on the Purchasing Preference of Mobile Phones Based on Science and Technology Development Features