

Configuration Manual

**An Analysis of User-Level Barriers to
Mobile Wallet Adoption for Financial
Inclusion**

MSc Research Project

Master of Science in FinTech

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MSc Project Submission Sheet
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Configuration Manual

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1 Introduction

This document provides a detailed technical configuration manual for the MSc research project titled, "An Analysis of User-Level Barriers to Mobile Wallet Adoption for Financial Inclusion." The purpose of this manual is to outline the specific hardware, software, tools, and methodologies employed throughout the research process. It serves as a comprehensive guide to ensure the transparency, consistency, and replicability of the study's findings.

2 System Specifications

2.1 Hardware Overview:

- Device name: DESKTOP-OGISF0N
- Processor: Intel(R) Core (TM) i7-5600U CPU @ 2.60GHz (2.59 GHz)
- Installed RAM: 16.0 GB (15.9 GB usable)
- System type: 64-bit operating system, x64-based processor

2.2 Windows Specifications:

- Edition: Windows 11 Home Single Language
- Version: 22H2

3 Software and Other Tools

The following Python libraries were used for data analysis and visualization. The code was executed in a Jupyter Notebook environment hosted on Google Colab.

Package Name	Description
pandas	For data manipulation and analysis
numpy	For numerical operations
seaborn	For statistical data visualization
matplotlib.pyplot	For creating static, animated, and interactive visualizations
scipy.stats	For statistical functions, including Chi-Square and Shapiro-Wilk tests
statsmodels	For statistical models, including logistic regression
scikit-learn	For machine learning, including LabelEncoder and logistic regression
warnings	To manage warning messages

Table 1

4 Data Processing and Analysis

The research utilized primary data collected through a survey. The following steps were taken to process and analyze the data:

4.1 Data Collection

A structured online questionnaire was administered to participants via **Google Forms**. The survey was distributed through digital platforms and social media, gathering **70 valid responses** from 11 countries.

4.2 Data Preparation

The raw data was exported from Google Forms as a CSV file and loaded into a *panda DataFrame* using Python (McKinney, 2010). The following preprocessing steps were performed:

- **Column Renaming:** The original column names, which were the full survey questions, were renamed to shorter, more descriptive names (e.g., 'Wallet_Use', 'Trust', 'Knowledge') for easier analysis.
- **Data Encoding:** The binary target variable, 'Wallet_Use', was encoded as 1 for "Yes" and 0 for "No". Other categorical variables like 'Income', 'Gender', and 'Age' were numerically encoded using LabelEncoder from scikit-learn (Pedregosa et al., 2011).
- **Likert Scale Conversion:** The 5-point Likert scale responses were converted to their corresponding numerical values (1-5)

4.3 Statistical Analysis

A series of statistical tests were conducted to analyze the data, with the code and detailed results available in the provided Jupyter Notebooks:

- **Descriptive Statistics:** Basic statistics were calculated to summarize the demographic data and responses. This analysis is detailed in the Primary_Data_Descriptive_Statistics.ipynb notebook.
- **Shapiro-Wilk Test:** This test was used to check for normality in the data distribution. The implementation can be found in Primary_Data_Shapiro_Wilk_Test.ipynb.
- **Chi-Square Test:** The relationship between demographic factors and mobile wallet usage was examined using the Chi-Square test (Virtanen et al., 2020). The code is in Primary_Data_Chi_Square_Test.ipynb and Primary_Data_Cross_tabulation_Analysis.ipynb.
- **Spearman Correlation Analysis:** Due to the non-normal distribution of the data, Spearman's rank correlation was used to assess the relationships between behavioral constructs (Virtanen et al., 2020). This is detailed in Primary_Data_Spearman_Correlation_Analysis.ipynb.
- **Logistic Regression Modelling:** A logistic regression model was built to predict mobile wallet adoption based on key variables like trust, knowledge, and ease of use (Pedregosa et al., 2011). The implementation and evaluation of this model are in Primary_Data_Logistic_Regression_Modelling.ipynb.

5 Appendix

The following are selected code snippets from the Jupyter Notebooks used in the research.

5.1 Chi-Square Test (Primary_Data_Chi_Square_Test.ipynb)

```
# Import libraries
import pandas as pd
from scipy.stats import chi2_contingency

# Load data
df = pd.read_csv("Survey on Mobile Wallet Adoption and Financial Inclusion.csv")

# Rename columns for clarity
df.rename(columns={
    'Please select your country?': 'Country',
    'What is your age range? ': 'Age',
    'Do you currently use a mobile wallet? ': 'Wallet_Use',
    # ... other renames
}, inplace=True)

# Define variable pairs to test
variable_pairs = [
    ('Country', 'Wallet_Use'),
    ('Age', 'Wallet_Use'),
    # ... other pairs
]

# Run Chi-Square Tests
for var1, var2 in variable_pairs:
    table = pd.crosstab(df[var1], df[var2])
    chi2, p, dof, expected = chi2_contingency(table)
    print(f"{var1} vs {var2} ->  $\chi^2 = \{chi2:.2f\}$ , p = {p:.4f}")
```

5.2 Spearman Correlation (Primary_Data_Spearman_Correlation_Analysis.ipynb)

```
# Import libraries
import pandas as pd
from scipy.stats import spearmanr
import seaborn as sns
import matplotlib.pyplot as plt

# ... (data loading and preprocessing) ...

# Define behavioral construct columns
behavioral_columns = ['Trust', 'Security_Confidence', 'Knowledge', 'Fees', 'Benefit',
'Ease_Use', 'Intention', 'Recommend', 'Resources']
df_behavioral = df_clean[behavioral_columns].copy()

# Calculate Spearman correlation
spearman_corr = df_behavioral.corr(method='spearman')

# Create heatmap
plt.figure(figsize=(12, 10))
sns.heatmap(spearman_corr, annot=True, fmt='.3f', cmap='coolwarm')
plt.title('Spearman Rank Correlation of Behavioral Constructs')
plt.show()
```

5.3 Logistic Regression (Primary_Data_Logistic_Regression_Modelling.ipynb)

```
# Import libraries
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import classification_report, roc_auc_score

# ... (data loading and preprocessing) ...

# Define features and target
features = ['Trust_in_Mobile_Wallets', 'Benefits_Outweigh_Costs',
'Knowledge_to_Use', 'Reasonable_Fees']
target = 'Do you currently use a mobile wallet?'

X = df_model[features]
y = df_model[target]

# Split data
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.25, random_state=42)

# Train model
logit_model = LogisticRegression(max_iter=1000)
logit_model.fit(X_train, y_train)

# Evaluate model
y_pred = logit_model.predict(X_test)
print(classification_report(y_test, y_pred))
print(f'AUC Score: {roc_auc_score(y_test, logit_model.predict_proba(X_test)[:, 1])}')"
```

5.4 Questionnaire and Frequency Analysis of Responses

- *Likert Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree*
- *Demographics Scale: Age: 1 = 18-29, 2 = 30-39, 3 = 40-49, 4 = 50 and above; Gender: 1 = Male, 2 = Female; Education: 1 = Primary, 2 = Secondary, 3 = Higher; Income: 1 = Below €500, 2 = €500-€1,500, 3 = €1,500-€3,000, 4 = Above €3,000*

Where: *EOU = Ease of Use; PU = Perceived Usefulness; SN = Social Norms; TR = Trust; PC = Perceived Cost; FC = Facilitating Conditions; BI = Behavioural Intention*

Questions	Abbr.	1	2	3	4	5	N/A
Demographics							
What is your age range?	AGE	35	22	12	1	-	-
What is your gender?	GEN	40	30	-	-	-	-
What is your education level?	EDU	2	1	67	-	-	-
What is income level (Monthly)?	INC	30	19	11	10	-	-
Do you currently use a mobile wallet?	USE	5	65	-	-	-	-
Ease of Use (EOU)							
It is easy for me to learn how to use a mobile wallet	EOU1	6	3	7	25	29	-
I find mobile wallets simple and straightforward to use	EOU2	6	3	6	26	29	-
Perceived Usefulness (PU)							
Using a mobile wallet helps me manage my finances more effectively	PU1	4	4	9	22	31	-
Mobile wallets are useful in my daily life	PU2	3	2	5	20	40	-
Social Norms (SN)							
People who are important to me think I should use mobile wallets	SN1	2	5	17	28	18	-
I would use a mobile wallet if people around me used it too	SN2	7	3	11	27	22	-
Trust (TR)							
I feel confident that mobile wallet platforms will keep my information secure	TR1	6	5	11	25	23	-

I trust mobile wallets for financial transactions	TR2	5	2	11	30	22	-
Perceived Cost (PC)							
The benefits of using mobile wallets outweigh the costs	PC1	3	2	13	27	25	-
Mobile wallet fees (if any) are reasonable for the convenience they provide	PC2	3	6	12	29	20	-
Facilitating Conditions (FC)							
I have access to resources (internet, smartphone, etc.) I need to use mobile wallets	FC1	3	1	4	20	42	-
I have the knowledge required to use a mobile wallet effectively	FC2	3	3	4	27	33	-
Behavioral Intention (BI)							
I intend to use mobile wallets regularly in the future	BI1	4	3	10	25	28	-
I would recommend mobile wallets to friends and family	BI2	4	4	8	26	28	-
Financial Inclusion Impact							
Has using a mobile wallet improved your access to financial services?	FII	-	-	-	-	-	Yes: 59, No: 11
Usage Frequency							
How often do you use mobile wallets?	FREQ	-	-	-	-	-	Daily: 37, Weekly: 24, Monthly: 4
Primary Use Case							
What financial services do you use most via mobile wallets?	USE_CASE	-	-	-	-	-	Payments: 64, Savings: 2, All: 1, Non: 1

Table 2

References

McKinney, W. (2010) 'Data Structures for Statistical Computing in Python', in *Proceedings of the 9th Python in Science Conference*, pp. 56–61.

Pedregosa, F., Varoquaux, G., Gramfort, A., Michel, V., Thirion, B., Grisel, O., Blondel, M., Prettenhofer, P., Weiss, R., Dubourg, V., Vanderplas, J., Passos, A., Cournapeau, D., Brucher, M., Perrot, M. and Duchesnay, E. (2011) 'Scikit-learn: Machine Learning in Python', *Journal of Machine Learning Research*, 12, pp. 2825–2830.

Python Software Foundation (2023) *Python Language Reference, version 3.11*. Available at: <https://www.python.org>.

Virtanen, P., Gommers, R., Oliphant, T.E., Haberland, M., Reddy, T., Cournapeau, D., Burovski, E., Peterson, P., Weckesser, W., Bright, J., van der Walt, S.J., Brett, M., Wilson, J., Millman, K.J., Mayorov, N., Nelson, A.R.J., Jones, E., Kern, R., Larson, E., ... van Mulbregt, P. (2020) 'SciPy 1.0: Fundamental Algorithms for Scientific Computing in Python', *Nature Methods*, 17, pp. 261–272.