**REPUBLIC OF CAMEROON**

***Peace - Work - Fatherland***

****

**Personal Expense Tracker with Data Analysis**

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**INTERNSHIP REPORT**

Internship carried out from the 01st July to 30TH September 2024

In view of obtaining a **Higher Technician Diploma** **(HTD) in** Computer Science.

Option: **Software Engineering**

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Academic Year 2023 - 2024

# DEDICATION

**TO MY FAMILY**

# ACKNOWLEDGEMENTS

As a prelude to this internship report we wish to express our sincere thanks to those who have assisted us and have contributed to the accomplishment of this report as well as the success of this great academic year. We would like specially to thank:

* We give thanks to the almighty God who made it possible without whom nothing would have been done.
* The Resident Representative of the African Institute of Computer Sciences, **Mr. Armand Claude Abanda.**
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* To all our teachers of the African Institute of Computer Sciences for their support.
* The amazing family at Realize for their endless love and support during this internship period.
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# LIST OF ABBREVATIONS

# ABSTRACT

During a three months internship, we diligently worked on the theme titled “Analysis, Design, and Implementation of a Personal Budget management Mobile Application”. This report presents the development of a personal expense tracking application designed to assist users in effectively managing their finances. This theme is a specific solution that arises from an observation within our society, where some individuals struggle with managing their money, particularly their budget.

The application facilitates the input, categorization, and storage of financial transactions, providing a comprehensive overview of spending habits. By employing data analysis techniques, the system generates insightful reports on expenditure patterns, identifying areas of potential savings and opportunities for financial growth. The application aims to empower users to make informed financial decisions, achieve financial goals, and ultimately enhance their overall financial well-being.

For its implementation, we used UML for the analysis and modelling, and JavaScript (React and Node) for creating the application. Additionally, we adopted the 2TUP process for its meticulous approach, allowing us to progress step by step while ensuring advancement through various tests.

Keywords

* Budget
* Expense
* Income

# RESUME

Lors d’un stage de trois mois, nous avons travaillé avec diligence sur le thème intitulé « Analyse, conception et mise en œuvre d’une application mobile de gestion de budget personnel ». Ce rapport présente le développement d’une application de suivi des dépenses personnelles conçue pour aider les utilisateurs à gérer efficacement leurs finances. Ce thème est une solution spécifique qui découle d’un constat au sein de notre société, où certains individus ont du mal à gérer leur argent, en particulier leur budget.

L’application facilite la saisie, la catégorisation et le stockage des transactions financières, offrant un aperçu complet des habitudes de dépenses. En utilisant des techniques d’analyse de données, le système génère des rapports perspicaces sur les habitudes de dépenses, identifiant les domaines d’économies potentielles et les opportunités de croissance financière. L’application vise à permettre aux utilisateurs de prendre des décisions financières éclairées, d’atteindre des objectifs financiers et, en fin de compte, d’améliorer leur bien-être financier global.

Pour sa mise en œuvre, nous avons utilisé UML pour l’analyse et la modélisation, et JavaScript (React et Node) pour la création de l’application. De plus, nous avons adopté le processus 2TUP pour son approche méticuleuse, nous permettant de progresser étape par étape tout en assurant l’avancement à travers divers tests.

Mots clés

* Budget
* Dépenses
* Revenus

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# GENERAL INTRODUCTION

Today our generation uses computers in order to do more tasks. It is for this reason that there is a need of professionals in the domain of computer sciences. Thanks to AICS (PAUL BIYA Technological Center of Excellence), we were able to undergo this training. During the second year of training, our institute recommends an internship for students in an enterprise in order to master theoretical and practical knowledge and to familiarize themselves with the professional milieu. It is for this reason that we requested an internship in an enterprise, REALIZE who opened its doors to us for a period of 3 months. This enterprise develops mobile, desktop and web applications, as well as other computer related services.

The work presented in this internship aims to design and implement a system that brings together the various functionalities required for an Expense Tracker Platform with Analysis and confronts the drawbacks of existing solutions. The achievement of this theme was carried out under six main sections which are:

**Insertion phase:** Here, we present the internship site and the theme which we will be working on.

**Existing system:** Here, we describe the structure of the existing system.

**Specification Book:** At this level, we identify the needs of the customer considering the timing and cost of the project.

**Analysis phase:** Will present the analysis of our project using UML as a modelling language, and as process, we used 2TUP.

**Conception phase:** Will present the generic conception, preliminary conception and detailed conception.

**Realization Phase:** Presents the different activities carried out to create the application.

**User Guide:** Presents the conditions necessary for the use of the application and how it is to be used.

# PART ONE: INSERTION PHASE

Preamble

This phase presents the details of how we were integrated in the host company, the company presentation and organization.

Overview

INTRODUCTION

1. WELCOME AND INTEGRATION
2. GENERAL PRESENTATION OF THE COMPANY
3. ORGANISATION OF THE XOMPANY
4. HARDWARE AND SOFTWARE RESOURCES OF THE COMPANY
5. BRIEF PRESENTATION OF THE PROJECT THEME

CONCLUSION

**INTRODUCTION**

The insertion phase is a period (generally of 02 weeks) reserve for the different interns to discover and to familiarize with the working environment. Here, we got to know about the staffs, the different hardware and software resources used, the different departments which constitute the enterprise, how the company function both internally and externally and we were introduced to our work space. During this period, we were also attributed an internship master often called professional supervisor and a theme. We also had a time to discuss amongst us interns on topics like what we love doing most, what we dislike, our believes and experiences. We shared about different realizations and failures in life.

## **WELCOME AND INTEGRATRION**

### Welcome

We arrived at REALIZE on Monday July 2024 at 8:00am. We were welcomed, by **Mr Ndabose Daniel** the enterprise frontend developer, who introduced us to our work space and his collaborators. Later run, he gave us the task to do some findings on the possible internship themes that we can work on.

### Integration

A working day at REALIZE start from 08:00am to 04:30pm. Our tasks in the company generally follow a predefine routine. Every day we were to write five pages of our internship report, to complete the assigned task for the day. It was also an opportunity to present our difficulties and challenges to everyone and receive directives.

## GENERAL PRESENTATION OF THE COMPANY

### Geographical location



Figure 1: Geographical location

### History

Realize is a Cameroon based non-governmental tech start-up institute founded by **NDELOGAKEH DANIEL** in 2022 which proposes IT solutions and empowers the use on new technologies in Cameroon.

### Mission

The mission of Realize mainly relates to the empowerment and the perpetuation of Technology use. These missions include:

* Design and realize mobile-oriented software for companies and individuals;
* Assist newborn companies for quick growth using computer sciences;
* Provide training and certifications to improve qualified human resources in many fields of study;
* Take an active part in the sustainable development of the world through innovative solutions and virtual reality.

### Vision

At Realize, we believe that the true potential of every organization and individual can be unlocked through the harmonious fusion of analysis, development, realization, and data analytics. Our vision propels us forward, guiding us to make a lasting impact on the digital landscape and shape a future where innovation knows no bounds.

### Activities

The activities of Realize range from computer sciences, engineering, and training. We can outline the following:

* Conception realization, and hosting of websites;
* Software development and maintenance;
* Training in Software related fields;
* Conception and realization of multimedia;
* IT consulting and innovation
* IT support

## ORGANISATION OF THE ENTERPRISE

### Administrative Organization of REALIZE

REALIZE is administratively organized as follows;

#### The General Management

### Functional organization of REALIZE

The functional branch of REALIZE is organized as follows;

## HARDWARE AND SOFTWARE RESOURCES OF THE COMPANY

### Hardware Resources

Table 1:Hardware resources of REALIZE

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Designation | Quantity | Characteristics | Observation |
| 1 | MacBook Pro | 1 | APPLE | Good |
| 2 | Modem | 1 | CAMTEL | Good |
| 3 | LCD Screen | 1 | HP | Excellent |
| 4 | Training equipment and office furniture | / | / | / |

### Software Resources

As an enterprise specialized in IT, REALIZE also comprises of software resources such as;

Table 2: SOFTWARE RESOURCES OF REALIZE (SOURCE: MERCURIAL 2022)

|  |  |
| --- | --- |
| Designation | Software |
| Operation system | Windows 10, Mac OS, parrot Linux |
| Design tools | Photoshop |
| Integrated development environment (IDE) | Visual studio code, |
| Text editor | Sublime text, Notepad++ |
| Database management system (DBMS) | MongoDB, PostgreSQL, MySQL |
| Web browser | Google chrome, Microsoft edge |
| Document editor | Microsoft office word |
| Presentation | Microsoft office PowerPoint |

## BRIEF PRESENTATION OF THE PROJECT THEME

During our insertion phase in REALIZE, we were asked to look for themes which solves a specific problem and something innovative. professional supervisor took some time to look into what we proposed as themes and he also proposed some themes ideas. Finally, we had to go for **“B”**. This Application will help the participants to create a seamless, efficient, and personalized online shopping experience for users while also benefiting merchants through increased visibility. Additionally, the App can provide real-time location for the sellers, which can offer several benefits.

## **Correct this page**

# PART TWO: EXISTING SYSTEM

## INTRODUCTION

When undertaking the analysis and management of a project, it is essential to understand the current state, also called the existing system. Studying the existing system allows us to evaluate the current situation, identifying strengths and weaknesses as well as determining opportunities for improvement. This is a crucial step that allows us to lay the foundations for the development and implementation of a successful project.

## THEME PRESENTATION

In the context where personal financial management is a major issue, the need for a mobile application for personal budget management is necessary. It is with this in mind that we took the analysis, design and creation of an application that aims to offer users a practical and intuitive tool to effectively manage their finances.

The main objective of this application is to help the end users track their income, expenses and overall budget in a simple and accessible way with a friendly user interface and advanced features.

The analysis of this project began with an in-depth study of the user’s needs and expectations regarding personal budget management. We identified key functionalities such as expense tracking, income tracking, transaction category, creation of personalized budgets, generation of reports and visualization of financial data. Based on these, we built advanced features such as overspending notification and reminder. We have used the latest mobile technologies to create an application that is robust, secure and compatible with major mobile platforms such as Android and iOS in the nearest future.

## STUDY OF EXISTING SYSTEM

Before proceeding with the conception and realization of our application, we carried out a detailed analysis of the existing system in that domain. This study enabled us to better understand the system such as its functionalities, strength and weakness. Thereby leading us to the following conclusions:

### POPULAR PERSONAL BUDGET MANAGEMENT APPPLICATIONS

We identified many applications already present in the market such as:

* Mint
* YNAB (You Need a Budget)
* PocketGuard

These applications offer the basic functionalities such as tracking expenses, creating budgets, and viewing financial data.

### COMMON FEATURES

Existing applications generally offer features such as:

* Monitoring of income and expenses
* Categorization of transactions
* Creation of personalized budgets
* Financial charts and reports
* Financial planning features

#### USER INTERFACE

Existing applications often focus on intuitive (easy to understand) user interfaces, with clear dashboards, interactive charts, and customization options for spending categories. Some applications offer swiping features to facilitate transaction management.

### LIMITATIONS AND WEAKNESS

Despite the functionalities offered, certain existing applications may present limitations, particularly in terms of:

* Customization of expense categories
* Management of budgets
* Absence of budget alerts settings

All of these contribute to the criticism of the existing system.

### CRITICISM OF THE EXISTING SYSTEM

Criticism makes you evolve,

|  |  |  |
| --- | --- | --- |
| CRITICISM | CONSEQUENCES | SOLUTIONS |
| Lack of user-friendliness:  Some existing applications  may be complex to use and lack a user-friendly  interface. | This can make personal budget management difficult for users who are unfamiliar with computer concepts | Set-up of a very user-friendly,  intuitive application enabling  users to easily navigate and  understand budget management  in order to make informed  decisions. |
| Although many applications offer basic features like tracking expenses and creating budgets. They can miss advanced features for deeper financial situation management like  personalization of expense categories or  generation of detailed reports | Restricted budget management  is not adaptive to different users thus leading to it being  abandoned | Implementation of an application  that adapts to the budgetary  management of each user allowing them to better visualize their budget situation and generate reports |
| Certain applications don’t have the functionality to save data online | Data loss and monitoring of their budgetary situation during the management period. | Implementation of an application  which will allow them to have access to the functionality of storing their data online which will be done online. |
| Lack of budget alert settings | The user is not aware of their overspending | Creation of an application that can give the possibility of configuring alerts. |

Although existing personal budgeting applications are available in the market, there are areas where they can be improved. Better usability, advanced features, deeper data visualization, increased personalization and stronger security are all aspects that could be improved to provide a more complete and efficient user experience in this area. All this therefore leads us to pose a problem.

## PROBLEMATIC

Considering all these shortcomings, how do we design a personal budget management mobile application that offers a user-friendly experience with advanced features, clear data visualization, in-depth customization and enhanced data security, in order to help users to optimize their budget management and archive financial stability?

## SOLUTION PROPOSAL

Noticing the weakness of certain personal budget management applications already present on developed application distribution platforms (Play Store, AppStore), an IT solution taking into account the weakness of certain applications currently available is relevant. The latter will have to address all the weaknesses that they encounter by making its strengths the addition of functionalities.

## CONCLUSION

In conclusion, the analysis of the existing design and production of mobile personal budget management applications revealed several shortcomings and opportunities for improvement. Existing applications may have issues such as limited usability, lack of customization of categories, insufficient data visualization, and data security concerns.

# PART 3: SPECIFICATION BOOK

Table of content

## INTRODUCTION

A specification book is a document which is established by the customer needing a particular product and the producer (engineer) who is to create the product, which is to be respected to its fullest during the period of realization of the product.

## Background and justification for the project

### Context

Effective management of personal finances is a challenge for many people in our society. Between daily expenses, bills, debt, saving goals and investments it can be challenging to keep an overview of your financial situation and make informed decisions. In this context a personal budget management mobile application offers a practical and accessible solution to help individuals better manage their finances.

This application allows users to track their spending, set budgets, view their income and savings, and even set specific goals (e.g. savings).

### JUSTIFICATION

The justification of this theme lies in the many benefits that a personal budget management mobile app can offer and generating reports.

Firstly, it allows you to have a clear view of your financial situation, which makes it easier to make decisions.

Secondly, users can identify areas where they spend excessively and adjust their budgets accordingly, working toward realistic saving goals.

In addition, this application has advanced features such as detailed reporting, financial trend analysis and spending alerts allowing users to better understand their spending habits and identify saving opportunities.

## PROJECT OBJECTIVES

After having identified the context and justified it, it is important for us to give the general and specific objectives of our project.

### General Objectives

We mainly have one main objective which is to provide users with an effective tool to help them manage their personal finances, more specifically their budget, in an optimal manner. The objective therefore encompasses several other specific objectives.

### Specific Objectives

We have several objectives to achieve when implementing our solution such as:

* Expense Tracking and Categorization:

Allow users to set custom budgets for different spending categories, providing tools to track and compare actual spending against fixed budgets.

* Clear visualization of income and expenses:

Provide users with an overview of their income, expenses incurred to help them plan and make informed financial decisions.

* Detailed reporting and analysis:

Provide in-depth reporting and analysis capabilities on spending habits, financial trends and deviation from set budgets, to enable users to better understand their financial situations.

* Alerts and Reminders:

Provide customized alerts and reminders features to notify users of overspending, payment deadlines, and savings goals.

* Data Security:

Ensure the security and privacy of users’ financial data by implementing robust protection measures, such as data encryption and secure authentication.

* User-friendly user interface:

Design intuitive, friendly and attractive user interfaces, with smooth navigation and easily accessible features, to provide a pleasant and engaging user experience.

### Expression of user needs

The analysis, design and creation of an application is based on very specific needs which can be functional or non-functional

1. Functional needs.

A functional need refers to a specific functionality that a system or product must offer to meet customer expectations. These needs focus on the actions and tasks the user wants to accomplish with the system such as:

* Categorization of expenses and income:

Offer the possibility of classifying expense and income into different categories (food, housing, transport, etc.) for better visualization and analysis.

* Budget creation:

Allows users to define personalized budgets for different spending categories and set monthly spending limits.

* Progress tracking:

Provide visual graphs to allow users to track their progress against their budget and savings goals.

* Overspending alerts:

Send notifications to users when their spending exceeds a predefined threshold to help them control their spending.

* Financial Reports:

Generate detailed reports on expenses, income, savings and financial trends for in-depth analysis.

* Management of user accounts:

This means that the administrator, through his actions, will be able to delete and have an overall view of the use of the application by users who are not administrators.

## Non-functional needs

A non-functional need, also called a non-functional requirement, concerns features and constraints that go beyond the specific functionality of the system. These needs focus on aspects such as performance, security, accessibility, usability, reliability, compatibility, availability etc.

* Performance

The application must be able to provide rapid response to user interactions, and handle complex calculations related to budgets, reporting, and analytics.

* Data security:

Users’ personal financial information must be secure and protected from unauthorized access, using appropriate encryption, authentication and backup measures.

* User and accessibility:

The user interface of the application should be user-friendly, with a clear layout, intuitive icons and easy navigation to make it easy for users.

* Reliability:

This application must be stable, without frequent crashes, and it must be able to correctly recover from errors or connection failures.

* Cross-platform compatibility:

The application should be compatible with different popular mobile operating system, such as Android and iOS, to allow users to use it on a variety of devices.

* Availability:

They should be available online or offline, allowing users to access their data and manage their budget even in the absence of internet connectivity.

* Scalability:

The application must be designed to handle increasing volumes of data and be able to adapt as new features are added or to support an increasing number of users.

* Privacy:

The application must comply with personal data protection regulations and provide users with control over the collection, use and the collection, use and disclosure of their financial information.

* Support and maintenance:

The application should be supported by a development team that provides regular updates, fixes bugs, and responds to user support requests.

## Project Planning

Generally, in project management, planning is essential to good management. To do this, we used the Gantt Project software to explain in the form of a graph how our project evolved over time, from the analysis to implementation through design.

### GANTT PROJECT

### ESTIMATED COST OF THE PROJECT

#### Human resource

The table below consist of the necessary human resources:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Analyst Designer | 01 | He will carry out the work of analyzing the problem and purpose | 150000FCFA | 18 | 2700000FCFA |
| Developer | 01 | His role is to produce an application on the basis of analysis produced by the analysts. | 100000FCFA | 28 | 2800000FCFA |
| Testers | 01 | He will carryout the unit tests in order to validate the solution obtained | 50000FCFA | 8 | 400000FCFA |
| Designer | 01 | He will be in charge of designing the different interfaces of our application | 100000FCFA |  | 1400000FCFA |
| TOTAL |  |  |  |  | **7300000FCFA** |

**Source:** Mercurial 2023

#### Software resources

|  |  |  |
| --- | --- | --- |
| Windows 10 Pro | Operating system | 167000FCFA |
| Gantt project | Free task scheduling software | Free |
| Visual studio Code | Code editor | Free |
| Microsoft Office 2019 | Office software | 175000 |
| Visual paradigm | Data modelling software | free |
| Mongo DB | Database server |  |
| Node js | Frontend and backend development | free |

#### Hardware resources

The table summarizes the equipment essential for deploying the application.

|  |  |  |
| --- | --- | --- |
| Name of materials | Quantity | Unit price |
| Laptop: Processor  Intel(R) Core (TM) i7-4600U CPU @ 2.10GHz 2.69 GHz  64-bit operating system, x64-based processor | 01 | 550000 FCFA |
| Total |  |  |

#### Total project cost

The table below summarizes the total cost required to deploy the application.

|  |  |
| --- | --- |
| Resources | Prices (FCFA) |
| Human resources |  |
| Hardware resources |  |
| Software resources |  |
| Unexpected (10%) |  |
| Total |  |

### Project Constraints

A constraint is a condition to be respected by the stockholders for the smooth running of the project. To successfully complete this project, the following constraints apply:

* Cost:

We must respect the fixed price in the financial study and avoid overestimation or underestimation of this price estimated at

* Deadline:

The project must respect the time interval defined by mutual agreement by the project managers and project owners which must extend over a period from July 1 2024 to September 30 2024.

* Quality:

After the price and a fixed deadline, we must produce a good quality application that meets the expressed needs and should allow easy use for users. The application must be very efficient, extensible and scalable

### Deliverables

The project will be only be received if at the end of the internship period we provide the following deliverables:

* A prototype of the application burned on a DVD.
* Specification
* An analysis file
* A design file
* A production file
* A functionality testing file
* A user guide and installation guide

## CONCLUSION

In conclusion, the specifications for a personal budget management mobile application must take into account both functional and non-functional needs. Well-defined specifications will make it possible to create a high performance, secure and user-friendly personal budget management application, offering users a smooth experience and allowing them to effectively manage their finances.

# PART THREE: ANALYSIS PHASE

# INTRODUCTION

The analysis file is devoted to the in-depth study of a project to develop a mobile application for personal budget management. The objective of this file is to provide a detailed analysis of the needs, the required functionalities, as well as the constraints and project objectives.

# Methodology

Nowadays, we have several methodologies which allows us to model the situation well in order to meets the concrete situation namely, UML (Unified Modelling Language), MERISE (Méthode d’Étude et de Réalization Informatique pour les Systèmes d’Entreprise) which will be the subject of comparison.

## UML and MERISE Comparative study.

UML and MERISE are languages and methods for modelling information systems. To carry out our work, we opted for the UML language for reasons of compatibility and for its object-oriented approach. Indeed, object-oriented programming brings out the extent of design-based work needed. We have the definition of classes, relationships between these classes, attributes, methods, and interfaces. The development of an application does not consist of launching directly into the code, but of carrying out a good analysis by:

* Organizing ideas, arguments and necessary documentation.
* Organizing the production by defining the modules and stages of production.

UML is a unified modelling language. It results from the union of three:

* OMT (Object Modelling Technique)
* OOSE (Object-Oriented Software Engineering) adopted by the OMG (Object Management Group) in version 1.1 as a modelling language for object information systems. We will use UML in version 2.5, which includes fourteen diagrams which are:
* Structural diagrams or static view:
* Class diagram
* Package diagram
* Object diagram
* Profile diagram
* Component diagram
* Composition structure diagram
* Deployment diagram
* Dynamic diagram
* Sequence diagram
* Activity diagram
* Collaboration diagram
* State transition diagram
* Use case diagram diagram
* Interaction Overview diagram
* Communication diagram
* Timing diagram

## Comparative study of unified processes

The unified process is a development method for object-oriented software. It is a generic, iterative and incremental method. It completes the system of UML models. There is no single development process or standard process, however essential characteristics can be highlighted:

* Driven by use cases
* Focus on architecture
* Use of design patterns

Among the unified processes we have:

* Rational Unified Processes (RUP)

The RUP method is a fairly heavy generic, iterative and incremental method, but it adapts very easily to development processes and needs. It allows you to use an architecture that is based on components. Then, changes that occur during the project can be supported and integrated directly. Each integration is done as the project progresses, and not at the very end when the risks are greater. Problems are thus discovered during the project and rectified.

* 2TUP (2 Tracks Unified Process):

The 2TUP proposes a Y-shaped development cycle, it begins with a preliminary study which essentially consists of identifying the actors who will interact with the system to costruct

# PART FOUR: CONCEPTION PHASE

# PART FIVE: REALIZATION PHASE

# PART SIX: USER’S GUIDE

# GENERAL CONCLUSION

# PART SEVEN:ANNEX:

# BIBLIOGRAPHY

# WEBOGRAPHY