

Original Research Paper

Student Expense Tracking System Using OCR

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Abstract: Nowadays student schedules are packed with their academic and curricular activities. Therefore, Students are no longer tracking their expenses because it is so hard to keep track with their expenses when they have a busy life. The aim of this research is to help students easily track their expenses by automating the process of extracting information from receipts. This research presents a student tracking expenses system using Optical Character Recognition (OCR) technology. The method that was used to develop the system was Website Development Life Cycle (WDLC). The system also uses Image Processing that implements OCR into the system. The system has been tested with a set of sample receipts, and the results show that it is able to accurately extract the relevant information with a high level of efficiency. The initial of this research involved designing the system, which was achieved through the creation of a detailed mockup and wireframe to establish a clear vision for its design. Then, it focused on developing the system, incorporating OCR technology to extract text from receipts. Thorough functional testing ensured that all system features, including user identification, image upload and OCR processing, expenditure management, budget setting, and data visualization, functioned as intended. The system offers users accurate and dependable capabilities for spending pattern analysis, budget management, and expense monitoring. Furthermore, the usability testing was conducted using the Post-Study System Usability Questionnaire (PSSUQ) from 30 students. The mean score of the System Usefulness, Information Quality and Overall Satisfaction is above 4 which indicates that it was appreciated by the students or respondents. Therefore, this system can be a valuable tool for students to manage their finances and make informed decisions about their spending.

Keywords: Expense Management, Image Processing, Optical Character Recognition (OCR), Student Tracking System, Usability Testing.



1. Introduction

Money budgeting is a crucial life skill that promotes financial stability and responsibility. By tracking expenses and adhering to a planned budget, individuals can manage their bills efficiently, build an emergency fund, and save for long-term goals such as purchasing a car or home. Effective budgeting provides both short-term and long-term financial security, guiding individuals toward financial freedom and independence. Moreover, budgeting helps individuals reach specific goals, allocate resources wisely, save for retirement, and develop awareness of spending patterns that influence their financial decisions.

Developing sound spending habits should begin at an early age because repeated financial behaviors stimulate dopamine release in the brain, reinforcing pleasurable and habitual actions. The most suitable time to cultivate these habits is during student years, when individuals begin receiving pocket money, typically between the ages of 7 and 11 [1]. Early exposure to financial management enables students to practice budgeting before entering adulthood. Consequently, this research aims to develop an application system designed to help students effectively track their expenses. The system visualises spending patterns and provides recommendations to avoid overspending, allowing users to monitor their financial behaviour despite busy schedules and thereby improve their overall money management skills.

In today's fast-paced academic environment, many students struggle to keep track of their expenses due to demanding schedules filled with academic and extracurricular commitments. According to Yeo et al [2], the abundance of new social opportunities and experiences often makes it difficult for students to manage both time and finances effectively. As a result, students tend to forget their daily expenditures, leading to miscalculations and insufficient funds by the end of the month. Without proper tracking, they lose awareness of their spending and fail to allocate resources appropriately.

Another significant issue is the lack of budgeting awareness among students. Many are unaware of how budgeting supports wise spending and informed decision-making. Studies have shown that students often overspend on non-essential items such as food, recreation, and online entertainment rather than prioritising books or savings [3], [4]. This lack of prioritisation leads to financial instability and missed opportunities for responsible financial growth. Moreover, limited financial literacy among students further aggravates the issue [5]. Without understanding basic budgeting concepts, students risk overspending and even facing personal bankruptcy at a young age [6]

To address these challenges, there is a pressing need for an efficient and user-friendly expense tracking solution. The proposed system categorises income into needs, wants, and savings, offering real-time visualisation of spending patterns through interactive graphs. Additionally, the system notifies users when they exceed their budget limits, promoting financial awareness and timely corrective actions.

This research is guided by three primary objectives to ensure that its goals are clearly defined and measurable. First, to design a system capable of tracking students' expenses efficiently. Second, to develop a student expense tracking system utilising Optical Character Recognition (OCR) technology, enabling the automatic extraction of financial data from receipts. Third, to test the system's functionality and usability to ensure it meets the needs of its users. These objectives provide a clear framework for system development and evaluation, ensuring that the final product effectively supports student financial management.

The research focuses on developing a digital system that assists students in managing their income and expenses effectively. The application generates recommended daily spending amounts based on user income and provides data visualisation through graphs to enhance spending awareness. Developed using Python in Visual Studio Code, the system incorporates OCR capabilities to automate expense data extraction. While the main target users are students, ranging from secondary school to university level, the system's functionality is broad enough to benefit anyone seeking better financial management. Its design emphasises accessibility, simplicity, and efficiency to ensure widespread usability.

This research holds significant value both practically and academically. It addresses a real-world issue faced by students in managing their finances by automating the expense tracking process. Through the use of OCR technology, the system accurately extracts essential data from receipts, such as date, amount, and vendor, reducing the time and errors associated with manual data entry. This automation not only enhances accuracy but also helps students gain valuable insights into their

spending habits. By storing and analysing financial data over time, users can identify spending trends and make informed decisions to improve their financial health.

Furthermore, this research contributes to advancements in OCR technology by developing a system capable of efficiently extracting and organising receipt data with high accuracy. The system promotes transparency and accountability in personal financial management, enabling users to record their expenses in a detailed and structured manner. Ultimately, the system fosters financial literacy, discipline, and responsibility among students, equipping them with the skills necessary for long-term financial stability and independence.

2. Literature Review

2.1. Overview of Finance Among Students

Finance refers to the management of money and encompasses activities such as budgeting, saving, investing, borrowing, and lending. Financial knowledge has become increasingly crucial in modern society because it significantly influences individuals' future financial well-being. According to Bakhtiar [3], finance is an important issue that should not be taken lightly or overlooked, as a strong understanding of financial management plays a vital role throughout one's life. Effective financial management contributes to financial stability, whereas poor financial management can lead to serious consequences, including bankruptcy.

The importance of financial management is particularly evident during students' formative years, as students are exposed to numerous financial demands and spending opportunities. One of the key factors influencing financial management is financial knowledge, since students with higher levels of financial knowledge tend to make better financial decisions [7]. For instance, a student who understands personal spending limits is less likely to prioritize wants over needs. Moreover, financial knowledge is not only essential for students' future career success but also has long-term implications for their families' financial well-being when they eventually marry and raise children [8]. Therefore, financial management can be broadly discussed through two important aspects.

1) Saving

Savings are amounts of something that you do not need to use or spend, such as time or money [9]. In order to save, students need to be disciplined because they have a lot of distraction at their studies. For example, junk food, magazines, games, cigarettes, and others. Besides that, according to Alwi et al [10], when it comes to making decisions, students are typically characterised as being readily swayed by their peers and being easily pompous. Although saving is a good habit, it still is still something that is challenging to students since it requires patient, maturity, and sacrifices. Habit is not something that can be nurtured in one night; it is a pattern of behaviour that is frequently repeated: an action or pattern of behaviour that is performed so frequently that it becomes typical of someone, even if they may not be aware of it [9]. Therefore, saving habits need to be nurtured in students during their early age.

Parents are crucial in teaching their children acceptable behaviour in all facets of life, including money management [11]. Parents are the first role models of every human being because a child lives by witnessing their parents' behaviour throughout the day. As they grow older, they will follow their parents' behaviour, such as talking, diet, saving and others. Therefore, parents should show a good example to their children in saving money so that their children will be used to saving habits when they grow older. There are so many benefits in having savings. Saving can be used when they are an emergency or a desire to buy something that are dreamed of, for example, a student can buy a laptop with high specifications for their studies without asking their parent money because they have a saving. Therefore, saving habits need to be nurtured to student at an early age.

2) Spending

Student life can be regarded as a transitional stage into young adulthood, during which individuals are required to manage various financial responsibilities related to their education, such as tuition fees, textbooks, and housing costs. Without careful financial planning, students may graduate with substantial debt burdens. For young individuals with limited financial resources, the use of credit cards can further exacerbate an already challenging financial situation.

One indicator of effective financial planning among students is the practice of budgeting. A study conducted among 240 college students in Kerala revealed that only about half of the students actively

prepared a budget, although more than 90 per cent managed to keep their expenditures within their income limits [4]. Budgeting plays a crucial role in helping students monitor and control their spending. A lack of spending awareness reflects poor financial management, which may ultimately lead to serious financial consequences, including bankruptcy [6].

Making wise money spending and managing money effectively is not only a healthy habit to develop, but it also helps you succeed financially in the future. Since students are regarded as the foundation of any nation, it is crucial for them to develop their physical and mental capacities to lay a solid foundation for a great country in the future. Students who practise wise money management will have a great future, which will benefit society and the country as a whole. Budgeting, saving, investing, spending, or any other method of controlling how much money an individual or group uses is known as money management. Students cannot follow their peers' spending habits blindly because all people have different backgrounds. They have to make a wise judgment based on people's spending.

2.2. Overview of Image Processing

Image processing is known as the process of converting an image into a digital format and carrying out specific procedures to extract some usable information from it. The image processing system usually treats all 2D signals when implementing a certain predetermined signal processing technique. Image processing has a big impact in modern technology; it can be used to reduce time consumption in doing a task [12]. For example, in business, to input data about a customer in system, we must input it manually based on the identity card. However, image processing can be used as an alternative solution so the process can be more efficient. Some of the main uses of image processing in the world of science and technology include computer vision, remote sensing, feature extraction, optical character recognition and others [13].

1) Technique in Image Processing

Image processing techniques that are discussed are image enhancement, object detection, image segmentation, and image restoration.

- **Image Enhancement**

Image enhancement aims to improve the visual quality of an input image for a specific region or application [14]. Fundamentally, it involves making the information contained in images easier for human observers to perceive and interpret, while also providing higher-quality input for subsequent automated image processing tasks [15]. The primary objective of image enhancement is to modify an image's characteristics so that it becomes more suitable for a particular purpose and viewing context.

During this process, one or more image attributes are adjusted, depending on the requirements of the task. The selection of which characteristics to enhance and the methods used to modify them are highly task-dependent. Image enhancement algorithms offer a wide range of techniques for transforming images to achieve improved visual appearance. The choice of an appropriate enhancement strategy depends on several factors, including the specific application, image content, observer characteristics, and viewing conditions.

- **Object Detection**

In digital films and photos, detection is a branch of computer science that deals with identifying examples of semantic items from classes like people, buildings, and cars. Face and pedestrian detection are two well-studied object detection areas. Many computer vision applications, including image retrieval and video surveillance, make use of object recognition [16]. Besides that, object detection is also used in recognising text in images and video. In the past, printed versions of documents, receipts for payments, and novels were published. Readers have to physically type them into a computer to create a digital format. But things are changing quickly, particularly in the information technology (IT) sector. The introduction of optical character recognition (OCR) has made the digitising process simpler for consumers.

OCR is technology that, by merely scanning the form, offers comprehensive alphanumeric recognition of printed or handwritten characters at electronic speed. The function of OCR are the forms containing character images can be scanned using a scanner, after which the OCR system's recognition engine interprets the images and converts them into ASCII data (machine-readable

letters). Figure 1 shows how OCR worked for character recognition. The car plate number is being scanned, then the number can be digitalized and can be inputted automatically in the system. Therefore, the process to input data can be done efficiently compared to manually entering data.

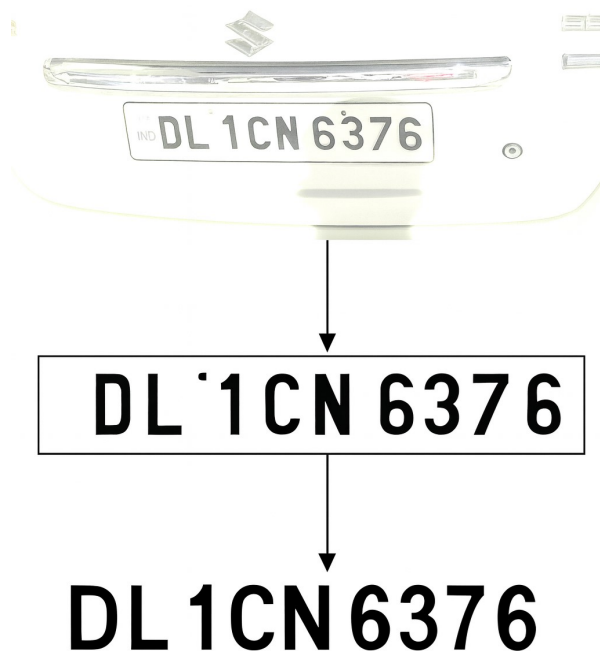


Figure 1. Character Recognition

- Image Segmentation

One of the most important image processing techniques is image segmentation. The method is employed to locate items in pictures. It separates the photos into sections (group regions), and then, utilising preprogrammed functions and algorithms, it finds and classifies things within each section [17]. It is the most difficult and complex aspect of image processing. The merits of picture segmentation quality and border orientation accuracy have a direct impact on the following area description and the analysis and understanding of images. All elements inside the image that fall into the same category will have a similar label assigned to them throughout the segmentation process.

As an example of image processing, it can be described by using a photograph of a farm. all the animals in these pictures would be grouped together, but farm equipment like tractors and shovels would be given a different title. As it is far simpler to identify these unique image segments inside a snapshot than it is to identify a single element within an image that comprises numerous other items, these distinct categories can then be submitted to a machine learning algorithm.

- Image Restoration

Image restoration is the process of recovering the original image by removing noise and blur from the image. It can be challenging to eliminate image blur in a variety of contexts, including photography, radar imaging, and the removal of motion blur brought on by camera shaking. Image noise is an undesired signal introduced into the image by the sensor, such as a thermal or electrical signal or environmental factors like rain, snow, and other factors [18], [19], [20]. A priori knowledge of the degradation is used in image restoration. It develops and assesses the objective standards of goodness. There are many restoration techniques in image restoration, such as median filter, adaptive filter, linear filter, iterative blind deconvolution, block-matching, Wiener filter and others [21].

Nowadays, there are many tools for image restoration, for example, the Clone Stamp Tool, Spot Healing Brush and Roto Brush Tool. Figure 2 shows an example of an image restoration technique. Tools used is the Spot Healing Brush. It removes unwanted spots or small objects from the image. As shown in the Figure 2, the other side has fewer freckles after the Spot Healing Brush are applied.

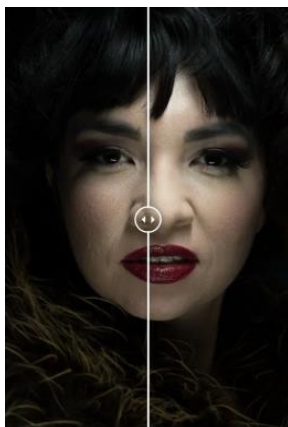


Figure 2. Spot Healing Brush Software Before and After Effect

2) Comparison Between Technique

Table 1 explains about comparison between techniques.

Table 1. Comparison Between Technique

	Definition	Technique used	Function	Application
Image Enhancement	Process of digitally manipulating a stored image using software	<ul style="list-style-type: none"> • Spatial domain method • Frequency domain method 	Recovering the original image by removing noise and blur from image	<ul style="list-style-type: none"> • Medical field
Object Detection	Computer vision task that involves identifying and accurately labelling objects within images, video frames, or live feeds	<ul style="list-style-type: none"> • OCR • ICR • OMR 	Processing images extremely rapidly and achieving high detection rates.	<ul style="list-style-type: none"> • Business • Security • Finance
Image Segmentation	Process by which a digital image is partitioned into various subgroups (of pixels) called Image Objects, which can reduce the complexity of the image, and thus analysing the image becomes simpler.	<ul style="list-style-type: none"> • Threshold-based • Edge-based • Watershed • Region-based 	Separates the photos into sections (group regions), and then, utilizing preprogrammed functions and algorithms, it finds and classifies things within each section	<ul style="list-style-type: none"> • Medical • Cultural • Industrial
Image Restoration	Process of recovering the original image by removing noise and blur from the image	<ul style="list-style-type: none"> • Median filter • Adaptive filter • Linear filter • IBD • Block-matching 	Improves the appearance of the image, making it look better and clearer.	<ul style="list-style-type: none"> • Medical imagine

2.3. Common Feature

Expenses tracking system with similar qualities to this research will be studied and discussed for comparative purposes and information viewers. Several expense tracking systems with similar qualities to this research will be discussed [22].

1) My Cash Flow

My Cash Flow is a free application designed to organise income and expenses. Firstly, users have to log in to their accounts to access their financial information [23]. User can set a passcode to ensure their financial review is safe [24]. However, if they find it time-consuming, they may remove the passcode to access their account. User can record their transaction either it is bank transactions or cash in hand. A cash-in-hand record is helpful for users since people tend to lose track of it in their daily lives. Next, the user can add attachments to their transaction, such as audio and photos. By doing that, they will remember more information about a certain transaction [25]. Then, a summary for the account will be made by monthly, yearly, and daily activities, and a report for it can be downloaded in pdf and excel format. Users do not have to worry about data loss for their transaction because this application can backup and restore transactions for incomes and expenses. So, if a user lost their device, they could still restore the data on the other device by logging in using their phone number. Figure 3 show MyCashflow interface.

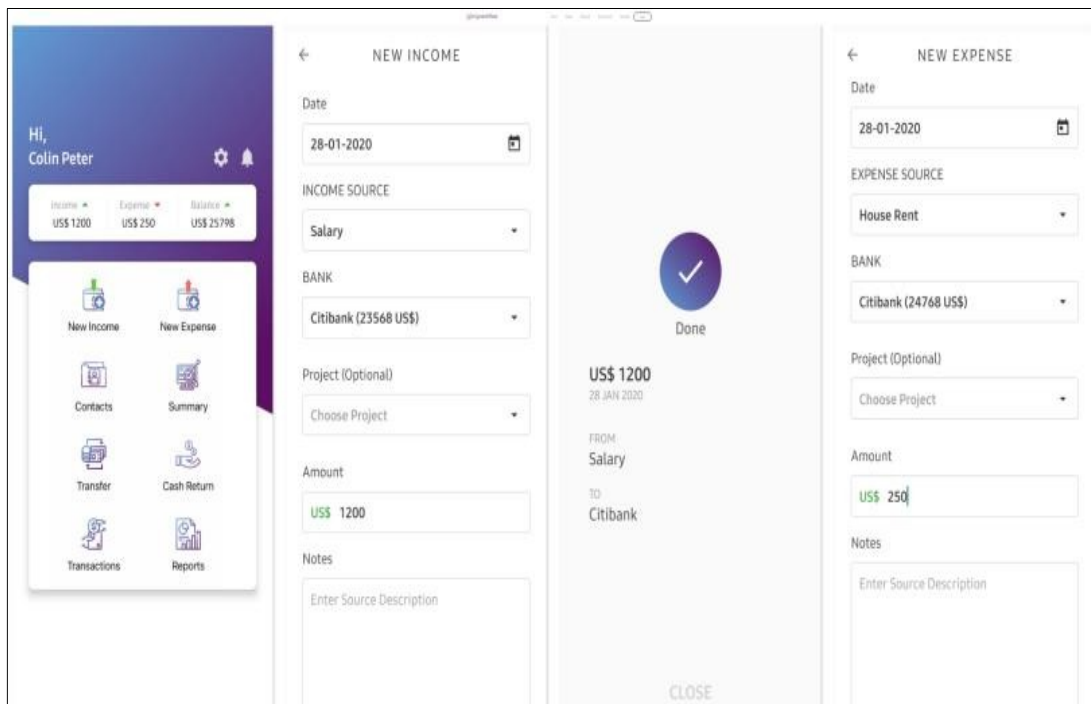


Figure 3. MyCashflow Interface

2) Money Manager Expense and Budget

The Money Manager Expense & Budget application has achieved significant popularity, with over 20 million downloads, approximately 270,000 user reviews, a 4.7 rating, and recognition as an Editor's Choice application on Google Play. This achievement can be attributed to its user-friendly interface and comprehensive feature set. The application provides weekly and monthly summaries, as well as budgeting tools that assist users in allocating and monitoring their expenses. In addition, an advanced budgeting feature allows users to set monthly budgets for individual spending categories, helping them avoid losing track of their finances.

Transactions can be categorized into various groups such as food, transportation, books, and others. Users are also able to attach supporting images, such as receipts, to each transaction, enabling better recall and verification of past expenses [26]. After transactions are recorded, users can review their financial information through well-organized and visually enhanced charts. The application presents spending data using pie charts that illustrate the distribution of expenses across different categories [27]. These visualizations increase users' awareness of their spending behavior and allow them to identify unnecessary expenditures, thereby encouraging more cautious financial decisions in subsequent months.

Furthermore, the application includes filtering options that enable users to review transactions by specific categories, such as food-related expenses. Users can also analyze their spending on a monthly basis using the calendar visualization feature, which helps in identifying spending trends over time. Figure 4 illustrates the interface of the Money Manager Expense & Budget application, while Table 2 presents a comparison with similar applications.

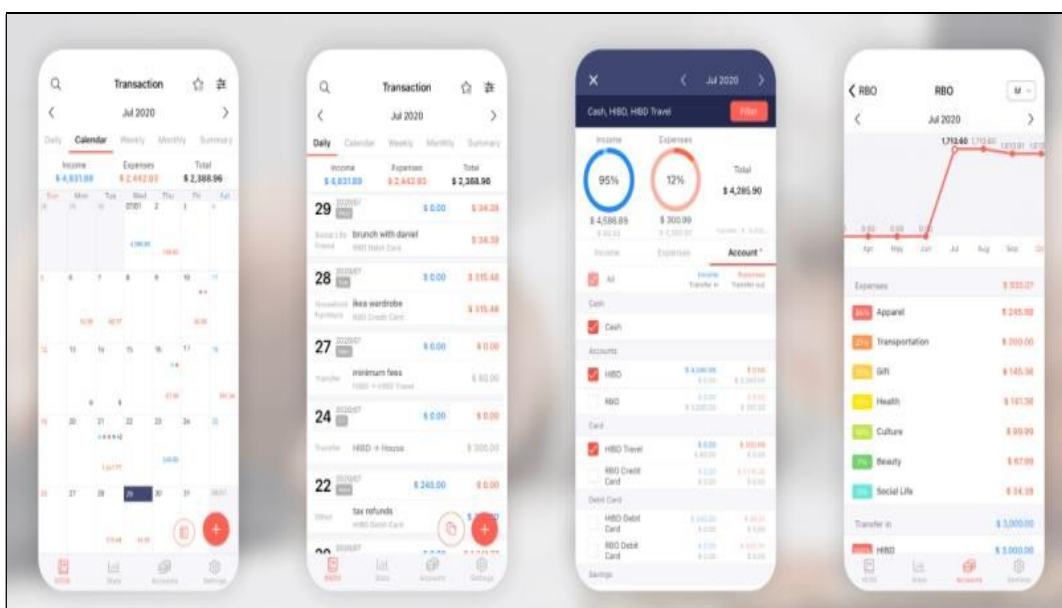


Figure 4. Money Manager Expense & Budget Interface

3) Monefy

Monefy is a free personal finance application that uses a one-click concept one clicks to record expenses. They promote simple features in this application rather than too many tools so that users will not be confused when using this application [28]. The user can record new expenses within a few seconds. Based on the picture below user just need to tap the '+' button to add new income and tap the '-' button to add new expenses. There is faster way to record expenses. The user just have to tap on any category icon around the chart, enter an amount and hit 'add'. Income and spending will be shown at the main page so the user will notice their spending patterns. Monefy has features to allocate budget, however user have to upgrade to the pro plan in order to have access to the features [29].

Overall, despite the lack of features in this application, it promotes simplicity and an easy way for users to track expenses so it will decrease time-consuming [30]. It depends on user preference, whether they like a simpler application or complicated application for tracking expenses. Figure 5 show Monefy interface.

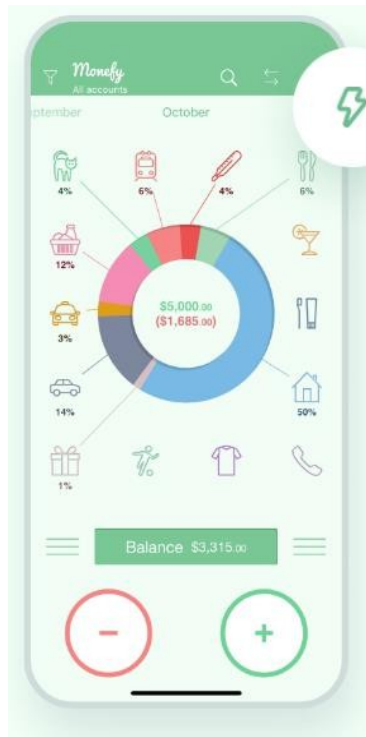


Figure 5. Monefy Interface

3. Methodology

Figure 6 shows the system architecture of Expenses Tracking System using OCR. Figure 6 illustrates the overall process of how the Student Expense Tracking System operates to help users, particularly students, manage and track their daily or monthly expenses efficiently.

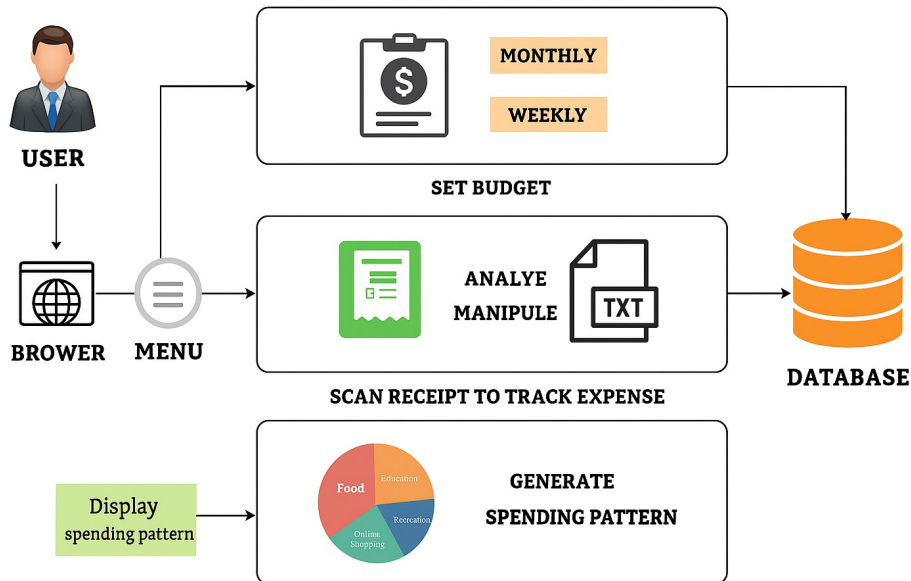


Figure 6. System Architecture of Expenses Tracking System using OCR

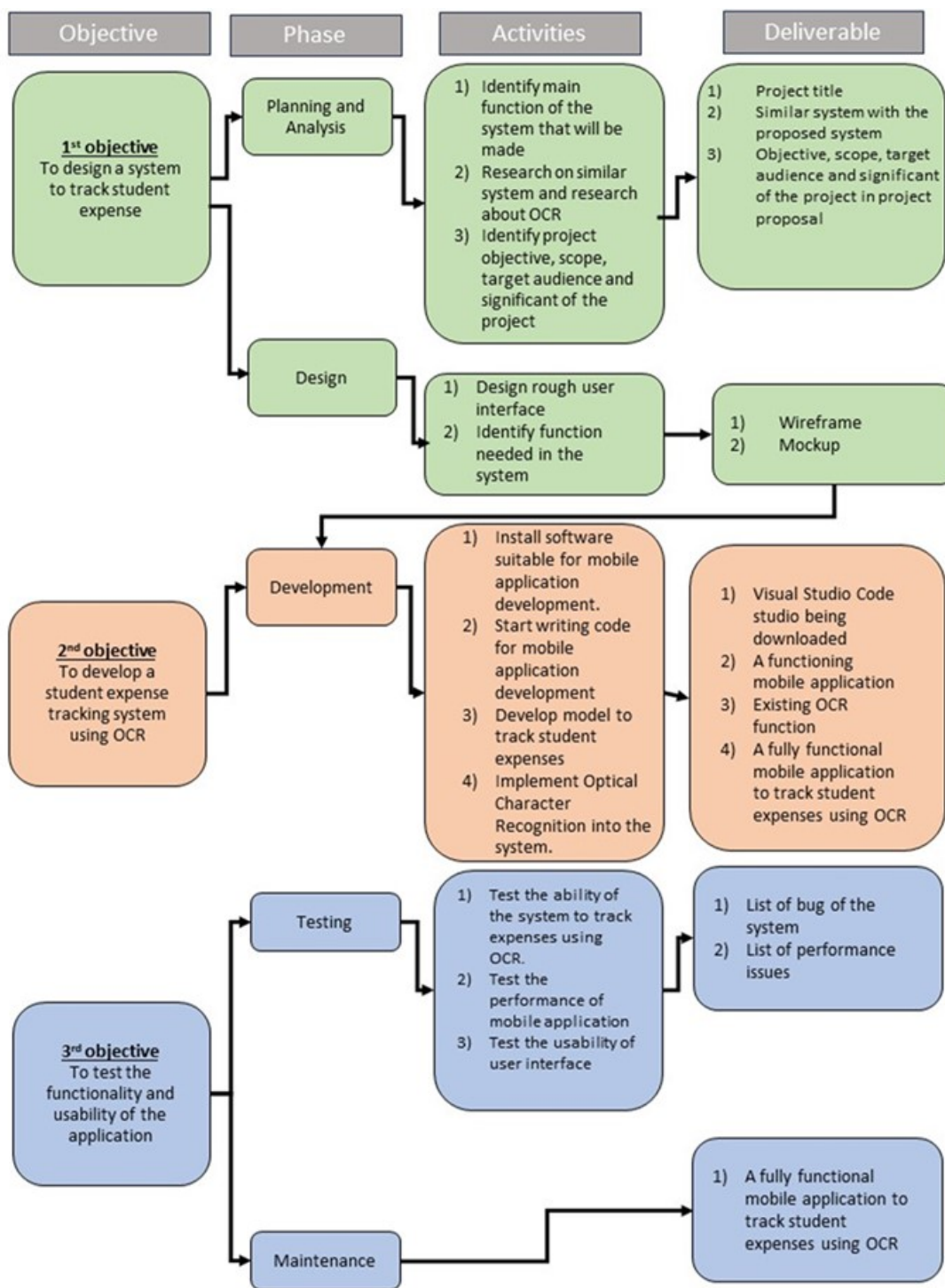


Figure 7. Research Summary

- 1) User Interaction
 The process begins with the user, who accesses the system through a web browser interface. The user navigates to the main menu, which serves as the control center for all available system functions.
- 2) Budget Setting
 From the menu, the user can set a budget based on their financial preferences—either weekly or monthly. This budget information is then stored in the database for future reference and comparison against actual expenses.

- 3) Expense Tracking via OCR
The system enables users to scan receipts to record their expenses. Using Optical Character Recognition (OCR) technology, the system automatically analyses and manipulates the scanned receipt to extract relevant details such as the item name, amount, date, and vendor. The extracted text data is stored in a text file (TXT) format before being transferred and saved in the database.
- 4) Data Storage and Analysis
All expense and budget data are securely stored in the database. The system continuously processes this data to compare actual spending against the set budget, ensuring real-time accuracy and reliability.
- 5) Spending Pattern Generation
Based on the recorded data, the system generates spending patterns in a visual format, such as charts or graphs. These visualizations categorize expenses into sections such as food, education, recreation, or online shopping, allowing the user to clearly understand their financial behavior.
- 6) Result Display
Finally, the spending patterns and financial summaries are displayed on the user's browser. This feedback enables users to monitor their expenses, identify areas of overspending, and adjust their financial decisions accordingly.

This research aim must be connected to the phases of the research methodology that were previously defined and described. Each aim, activity, and output from an activity must be linked to the appropriate phase. The first objective is to plan and analyse information on Optical Character Recognition OCR which is mentioned in the ideation and discovery phase. Then, for the second objective, it has been executed in the design and development phase, where the application development process has been made here. Lastly, phase testing and maintenance satisfy the third objective, which is to test the functionality of the application. Figure 7 show summary of the research methodology.

4. Finding and Discussion

4.1 System Development

The login screen, where users must enter their username and password, welcomes users to the user interface. They can click the login button to start the login procedure after inputting their credentials. The user is successfully authenticated and redirected to the home page or dashboard if the entered username and password are correct and match the data in the system. The user must input their username and password again to try to log in if the provided credentials are invalid or do not exist in the system, and an error message is displayed. This strategy guarantees that only authorised users can access the system and offers users a simple and safe login process.

Users who are logged in are shown pertinent information on the user interface's main page. For a more individualised experience, the user's session information, such as their username or profile image, is clearly displayed in the upper right corner. Three main buttons can be found on the home page: "Add Expense," "Set Budget," and "Spending Pattern." Each button sends the user to a different system page or module. The user is directed to a page where they can enter their expenses after clicking the "Add Expense" button. The user is taken to a screen where they can specify their budget limits after clicking the "Set Budget" button. The "Spending Pattern" button brings up a page where the user can view reports or graphic representations of their spending trends and behaviours. Users may simply access the needed functionality and carry out several operations linked to spending tracking and administration thanks to this design's easy layout.

The home page is shown in Figure 8.

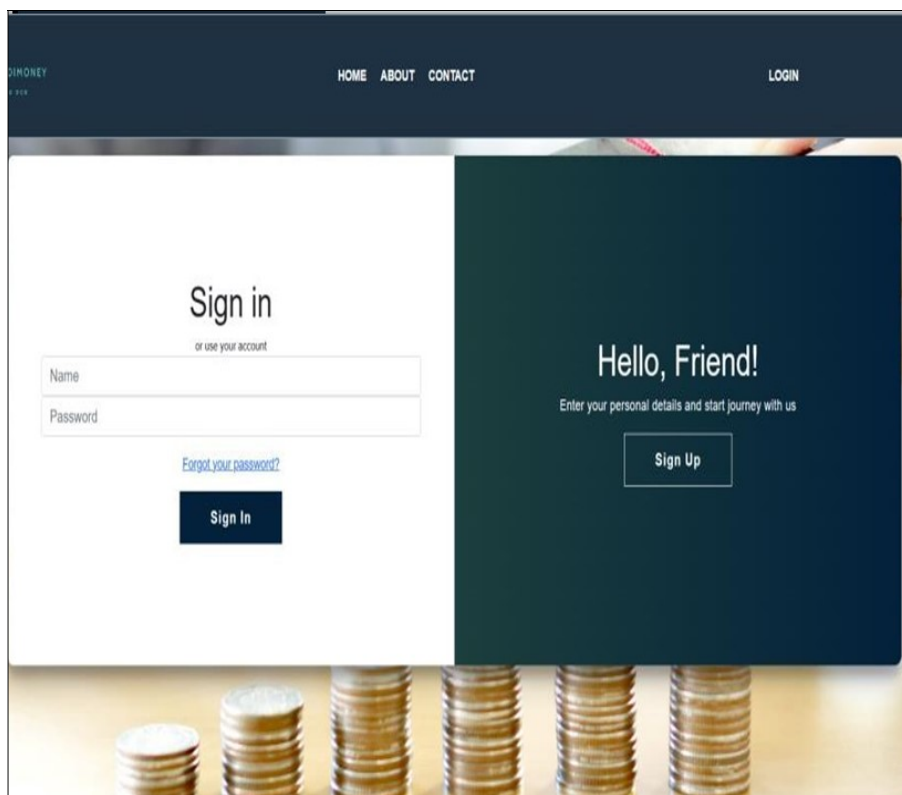


Figure 8. Login Page

The database consists of three tables: "budget," "users," and "daily expenses." The "budget" table contains information about the monthly budget for each user. It includes the primary key "id" for unique identification, a foreign key "user_id" to establish a relationship with the "users" table, the "month" and "year" columns to specify the budget period, and the "amount" column to store the budgeted amount for that period. This table establishes a one-to-many relationship with the "users" table, as one user can have multiple budget entries. The "users" table stores information about individual users. It includes the primary key "user_id" for unique identification, along with columns such as "username," "user_password," "user_email," "user_phone," "first_name," and "last_name" to store user-specific details. This table acts as the parent table for both the "budget" and "daily expenses" tables, creating one-to-many relationships with these tables. The "daily expenses" table contains records of daily expenses made by users. It includes the primary key "expense_id" for unique identification, a foreign key "user_id" to establish a relationship with the "users" table, the "date" column to store the expense date, the "amount" column to store the expense amount, and the "category" column to categorise the type of expense. This table also forms a one-to-many relationship with the "users" table, as one user can have multiple expense entries.

Since algorithms offer a systematic and step-by-step method for solving problems, making decisions, and organising data and activities in a project, they are essential for understanding and developing project architecture.

The programme looks for uploaded images and uses OCR to extract text from them. It looks for the word "TOTAL" in the text that was extracted. Upon discovery, it extracts the final cost and stores the picture. The extracted total price is then passed along to the 'add_expense' route, where the user is subsequently directed. An error notice is provided if any errors are found during the OCR process. Overall, the method makes sure that image uploads, OCR extraction, and navigation using the extracted information are handled correctly while gracefully resolving exceptions.

Algorithm for OCR:

1. Begin the 'upload' function.
2. Check if the 'images' key is present in the request files. If not, return a response of 'No image uploaded!' with a status code of 400.
3. Retrieve the image file from the request files using the 'images' key.
4. Open the image file using the PIL library and assign it to the 'image' variable.
5. Try to perform OCR on the image using the pytesseract library:
 - a. Convert the image to text using 'image_to_string' function and assign the result to 'ocr_result'.
 - b. Define the currency symbol as "TOTAL".
 - c. Search for the index of the currency symbol in the 'ocr_result' string and assign it to 'total_price_index'.
 - d. If the currency symbol is found (total_price_index != -1):
 - Extract the total price from the 'ocr_result' string by slicing it from the index of the currency symbol plus its length plus one, up to the first whitespace character.
 - Save the uploaded image to a specified directory using the 'save' method and a predefined 'save_path'.
 - Redirect the user to the 'add_expense' route, passing the extracted total price as a parameter named 'amount'.
6. If any exception occurs during the OCR process, catch the exception and return an error message with the specific exception details and a status code of 500.

4.1. Usability Testing

The Post-Study System Usability Questionnaire (PSSUQ) was used to rate the system's usability (Putra et al., 2020). A sample of 30 students from Universiti Teknologi MARA (UITM) were given the questionnaire, which was based on Appendix B, via Google Forms. The students were required to respond to the questionnaire, giving their opinions on various facets of the usefulness of the system. The responses from the questionnaire served as the foundation for the results. The PSSUQ offers insightful information on how well the system conforms to the user's expectations and usability requirements for students.

Using the PSSUQ method, which assigned numerical values to each response on a scale of 1 to 5, the questionnaire responses were analysed. For each question, the mean average was computed in order to evaluate the usability of the system.

Table 2. Evaluation and Percentage for Each Statement

No	Questionnaires Statement	Mean Score
1	Overall, I found the system easy to use.	4.6
2	The system provided clear and understandable instructions.	4.3
3	I felt confident in my ability to use the system to track my expenses.	4.1
4	The system's response time was satisfactory.	4.5
5	The system's layout and design were visually appealing.	4.7
6	The system efficiently recognized and extracted text from receipts.	4.4
7	The system effectively organized and presented my expense data in a meaningful way	4.2
8	The system effectively provided insights into my spending patterns.	4.3
9	I encountered few errors or glitches while using the system.	4.6
10	I would recommend the system to others for tracking their expenses.	4.8

Based on the results shown in the Table 2, the system demonstrates consistently high mean scores across nearly all aspects of user experience, indicating a strong level of overall satisfaction. Users found the system easy to use (4.6) and appreciated its visually appealing design (4.7), suggesting that the interface and navigation are well-designed. The instructions provided were rated clear and understandable (4.3), helping users to operate the system smoothly. Users also reported feeling confident when tracking their expenses (4.1), which, although positive, still suggests some room for improvement in terms of guidance or support features. In terms of performance, the system was praised for its satisfactory response time (4.5) and minimal errors or glitches (4.6), reflecting strong technical stability. Core functionalities including text recognition from receipts (4.4), data organization (4.2), and insights into spending patterns (4.3), were also evaluated as effective, showing that the system successfully meets key user needs. Overall, users expressed very high approval, with a recommendation score of 4.8, indicating that they consider the system reliable and valuable for managing daily expenses.

The results of the usability testing are shown in Table 3, along with the mean average scores for each question. These scores give important information about the system's efficiency and user satisfaction and reflect how the participants felt about the usability of the system. Enhancing the student expense tracking system utilising OCR is made possible by analysing these findings, which enables an evaluation of the system's strengths and areas for improvement.

Table 3. Usability Mean Score for The Evaluation

Contents	Evaluation of Questions	Mean Score
System Usefulness	Based on questions 1 to 5	4.44
Information Quality	Based on question 6 to 10	4.46
Overall Satisfaction	Based on questions 1 to 10	4.45

According to Table 4, the level of satisfaction increases as the score rises. A 3 is, nevertheless, regarded as neutral for the score. The greatest mean score was attained by item 1,5,8, as indicated in Table 3. This shows that the system's quality, usability, and overall performance were appreciated by the respondents. The items with the lowest mean scores were 3, 7, and 18. The findings showed that respondents were happier with the system's utility than the calibre of the information. Questions 1 through 10 were used to construct overall satisfaction scores. The findings indicate that the mean score for overall system satisfaction is 4.45.

Table 4. Functionality Testing

No	Test Scenario	Expected Result	Actual Result	Status
1	User login with valid credentials	User is successfully logged in	User is successfully logged in	Passed
2	User login with invalid credentials	User login fails with appropriate error message	User login fails with appropriate error message	Passed
3	User uploads a receipt image	Image is successfully uploaded and saved in the system	Image is successfully uploaded and saved in the system	Passed
4	OCR successfully extracts text from the image	Text is accurately extracted from the uploaded image	Text is accurately extracted from the uploaded image	Passed
5	Total amount is found in the extracted text	Total amount is correctly identified and displayed	Total amount is correctly identified and displayed	Passed
6	Total amount is not found in the extracted text	User receives an error message to re-upload the image	User receives an error message to re-upload the image	Passed
7	User adds a new expense	Expense is added and saved in the system	Expense is added and saved in the system	Passed

4.2. Functionality Testing

Table 4 shows the functionality testing for the Student Expense Tracking System using OCR. The test results indicate that all system functionalities performed as expected, demonstrating the reliability and effectiveness of the implemented features. Users were able to log in successfully with valid credentials and received appropriate error messages when invalid credentials were used, ensuring secure authentication. The system also performed accurately in handling receipt uploads, with images successfully saved and processed through Optical Character Recognition (OCR). The OCR feature effectively extracted text from the uploaded receipts, and the total amount was correctly identified and displayed. In cases where the total amount was not detected, the system appropriately prompted the user to re-upload the image, confirming proper error handling. Additionally, the process of adding new expenses functioned smoothly, with all data successfully stored in the system. Overall, the results confirm that the system meets its functional requirements and operates reliably across various user scenarios.

5. Conclusion

A bad money management system results from pupils' inability to manage their finances and expenses. Their lack of financial literacy, it causes them to go bankrupt when they become adults. In order to motivate students to keep track of their spending, the student spending Tracking System employing OCR has defined three objectives. Based on the project objectives, its importance was established. To enhance the project's conceptual framework and interpretation, several research publications were examined. The waterfall model was employed to produce WDLC since it was thought that this method would fit well with system development. The implementation uses both hardware and software. Flowcharts, architectural designs, schematic diagrams, and development are just a few examples of the project design aspects that are included. This design was created to provide a general overview of the system's appearance and operation. In summary, the project has been proven, and the WDLC has been successfully tested. The system may help students keep track of their costs.

Future work for this study involves enhancing the expense categorisation system through the implementation of Natural Language Processing (NLP) and Machine Learning (ML) techniques. By integrating NLP, algorithms can analyse text extracted from receipts, using approaches such as text classification and Named Entity Recognition (NER) to identify keywords, entities, and patterns indicative of expense categories, such as recognising a restaurant name as a food-related expense. This process requires text preprocessing, tokenization, and training on labelled datasets to ensure accurate categorisation, with continual refinement to improve performance. In parallel, machine learning models can be developed to predict expense categories automatically by learning associations between text features and labelled categories. Algorithms such as decision trees or random forests can be employed, allowing the system to classify new expenses efficiently. Regular evaluation and staying updated with advances in NLP and ML are crucial to enhancing the system's accuracy, robustness, and overall effectiveness in streamlining expense tracking.

References

- [1] J. Bonke, *Do Danish Children and Young People Receive Pocket Money?*, 2013. [Online]. Available: www.rff.dk. [Accessed: Jan 2025].
- [2] K. Charntaweekhun and S. Wangsiripitak, *Visual Programming Using Flowchart*, 2006.
- [3] J. L. Yeo, P. S. JosephNg, K. A. Alezabi, H. C. Eaw, and K. Y. Phan, "Time Scheduling and Finance Management: University Student Survival Kit," in *Proc. IEEE Student Conf. Research and Development (SCORED)*, pp. 16–21, 2020.
- [4] I. S. Bakhtiar, M. H. Jamaluddin, M. A. M. Salim, and M. N. Harun, "Student Spending Non-Academic Item – Lead to Poor Financial Management," in *Proc. Int. Conf. Student and Disable Student Development (ICoSD)*, vol. 407, no. 1, 2019.
- [5] R. Manju, "Trends in Spending and Money Management Practices among Students of Kerala," *Int. J. Research in Humanities and Social Studies*, vol. 3, no. 10, 2016.
- [6] N. Susanti, R. Rahmayanti, R. R. Padmakusumah, and R. Susanto, "Factors Affecting Students' Financial Literation: A Study on Widyatama University, Indonesia," *Universal J. Educational Research*, vol. 7, no. 5, pp. 7–14, 2019.

- [7] M. Selvanathan, U. D. Krisnan, and W. C. Wen, "Factors Effecting Towards Personal Bankruptcy among Residents: Case Study in Klang Valley, Malaysia," *Int. J. Human Resource Studies*, vol. 6, no. 3, p. 98, 2016.
- [8] L. Falahati and L. H. Paim, "Toward a Framework of Determinants of Financial Management and Financial Problems among University Students," *African J. Business Management*, vol. 5, no. 22, pp. 9600–9606, 2011.
- [9] S. M. Danes and T. K. Hira, "Money Management Knowledge of College Students," *J. Student Financial Aid*, vol. 17, no. 1, 1987.
- [10] R. Rikwentishe, B. Musa Pulka, and S. K. Msheliza, "The Effects of Saving and Saving Habits on Entrepreneurship Development," *Eur. J. Business and Management*, vol. 7, no. 23, 2015.
- [11] S. Alwi, I. Zura, A. Hashim, and M. S. Ali, "Factors Affecting Savings Habits within Millennials in Malaysia: Case Study on Students of Taylor's University," 2015. [Online]. Available: www.globalbizresearch.org. [Accessed: Jan 2025].
- [12] W. Satyawan *et al.*, "Citizen ID card detection using image processing and optical character recognition," *Journal of Physics: Conference Series*, vol. 1235, no. 1, 2019.
- [13] B. Basavaprasad and M. Ravi, "A study on the importance of image processing and its applications," *International Journal of Research in Engineering and Technology*, 2020.
- [14] H. Kaur and N. Sohi, "A study for applications of histogram in image enhancement," *The International Journal of Engineering and Science*, vol. 6, no. 6, pp. 59–63, 2017.
- [15] N. D. S. Mohamad Ghazali and A. F. Saad, "Online student performance system integrating multidimensional data visualization and chatbot for primary school," *International Journal of Artificial Intelligence*, vol. 9, no. 2, pp. 63–73, 2022.
- [16] K. Jain, T. Choudhury, and N. Kashyap, "Smart vehicle identification system using OCR," in *Proc. 3rd IEEE International Conference on Advances in Computing, Communications and Informatics*, 2017.
- [17] A. Abdulrahman and S. Varol, "A review of image segmentation using MATLAB environment," in *Proc. 8th International Symposium on Digital Forensics and Security (ISDFS)*, 2020.
- [18] S. Rani, S. Jindal, and B. Kaur, "A brief review on image restoration techniques," *International Journal of Computer Applications*, vol. 150, no. 12, pp. 30–33, 2016.
- [19] S. I. Ao *et al.*, *International MultiConference of Engineers and Computer Scientists (IMECS 2014)*, International Association of Engineers, Hong Kong, 2014.
- [20] K. Flora, X. Wang, and S. V. Chande, "An investigation into mobile application development processes: Challenges and best practices," *International Journal of Modern Education and Computer Science*, vol. 6, no. 6, pp. 1–9, 2014.
- [21] E. D. Liddy, *Natural Language Processing*. Syracuse University, 2001.
R. Maini and H. Aggarwal, *A Comprehensive Review of Image Enhancement Techniques*, vol. 2, 2010.
- [22] C. A. Makridis, J. D. Kelly, and G. Alterovitz, "Using machine learning to understand veterans' receipt of loans in the paycheck protection program," SSRN, 2020. Available: <https://ssrn.com/abstract=3725665>. [Accessed: Jan 2025].
- [23] D. K. S. Neoh *et al.*, "PicToText: Text recognition using Firebase Machine Learning Kit," in *Proc. 2nd International Conference on Artificial Intelligence and Data Sciences (AiDAS)*, 2021.
- [24] T. T. H. Nguyen *et al.*, "Deep statistical analysis of OCR errors for effective post-OCR processing," in *Proc. ACM/IEEE Joint Conference on Digital Libraries*, pp. 29–38, 2019.
- [25] A. R. Putra, S. H. Wijoyo, and Y. T. Mursityo, "Evaluasi usability dan perbaikan user interface pada aplikasi KRL Access menggunakan metode HCD dan PSSUQ," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 4, no. 1, 2020.
- [26] N. Sawarkar, P. Yenagandula, D. Shetye, and S. Agrawal, "Expense Manager: An expense tracking application using image processing," *International Research Journal of Engineering and Technology*, 2022.
- [27] R. Smith, "Limits on the application of frequency-based language models to OCR," in *Proc. International Conference on Document Analysis and Recognition (ICDAR)*, pp. 538–542, 2011.
- [28] I.-Y. Song, M. Evans, and U. E. K. Park, "A comparative analysis of entity-relationship diagrams," *Journal of Computer and Software Engineering*, vol. 3, no. 4, 1995.

- [29] S. Weil, “UB-Mannheim/tesseract,” GitHub, 2023. Available: <https://github.com/UB-Mannheim/tesseract>. [Accessed: Jan 2025].
- [30] A. F., “Online convenience store system using multidimensional data visualization,” *International Journal of Education, Science, Technology, and Engineering (IJESTE)*, vol. 6, no. 1, pp. 25–34, 2023.