

Maximizing Data Management Efficiency: Utilizing VBA Macros and VLOOKUP Automation in Excel

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Abstract— Microsoft Excel, a pivotal element of the Microsoft Office suite, operates as a dynamic electronic spreadsheet delineated by rows and columns. Primarily designed for data organization, graphical representation, and numerical computations, Excel stands out for its robust capabilities in data analysis, visualization, and reporting. Its extensive array of standard features caters to diverse user needs. Furthermore, Excel's versatility extends through integration with Visual Basic for Applications (VBA) macros, which empower users to customize and enhance functionality. This exposition aims to delve into the realm of VBA macros within Excel, shedding light on their myriad applications and showcasing their potential to streamline operations. By automating repetitive tasks and simplifying complex procedures, VBA macros not only boost productivity but also unlock new possibilities for efficiency. This paper seeks to provide a comprehensive understanding of VBA macros, illustrating their role as indispensable tools in maximizing Excel's utility.

Index Terms— Data Management, Organizations, Visual Basic for Applications (VBA) macros, Microsoft Excel, VLOOKUP function, Industrial spreadsheet datasets, Task automation.

I. INTRODUCTION

A database Microsoft Excel, developed by Microsoft, is a spreadsheet software program that forms part of the Microsoft Office suite, alongside applications like Word, PowerPoint, and Outlook. It is extensively utilized for various purposes such as data analysis, financial modelling, budgeting, statistical analysis, and more. An Excel Macro comprises pre-programmed commands compiled to execute specific tasks, ranging from simple actions like formatting cells to more intricate operations such as compiling and analysing data. These macros are written in Visual Basic for Applications (VBA), a programming language. They can be generated either by recording a sequence of tasks or by manual coding in VBA.

VBA Macros leverage the Visual Basic Application within Excel to create customized user-generated functions and expedite manual tasks through automated processes [5]. Furthermore, VBA enables access to the Windows Application Programming Interface (API), facilitating the customization of the user interface by crafting personalized toolbars, menus, dialog boxes, and forms. The true strength of Excel macros lies in their capacity to automate repetitive tasks, thereby saving considerable time and effort. Macros can be programmed to run

automatically or can be triggered manually. They can execute simple actions like formatting or complex routines such as data analysis and report generation.

For instance, a finance professional may need to generate a recurring report monthly. Instead of dedicating hours each month to perform identical tasks, they can develop a macro that accomplishes everything within minutes. This translates to reduced manual labour and more time for strategic analysis.

Beyond automation, macros possess the capability to perform tasks exceeding Excel's built-in capabilities. They can interact with other Microsoft Office applications, interface with external databases, and even control other applications [2].

Tasks like data entry, spreadsheet formatting, and report generation can consume significant time when done manually. However, with macros' assistance, these tasks can be automated, enabling finance professionals to save valuable time and effort.

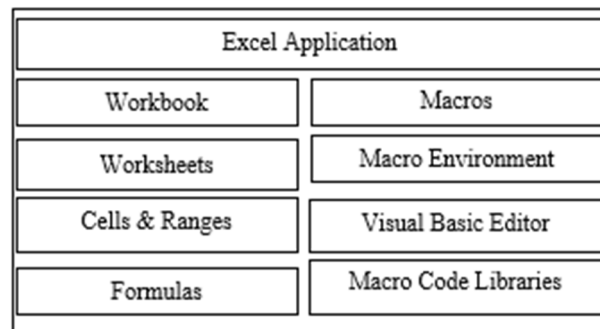


Figure1. Block Diagram of SQL

The architecture of Excel macros comprises various components within the Excel application as shown in figure no. 1, facilitating the creation, execution, and management of automated tasks. The Excel application serves as the central environment for macro operations. Macros are typically stored and executed within workbooks, acting as containers for worksheets and other elements. Worksheets house cells and ranges where data is stored and manipulated, forming the foundation for macro interactions. Macros, written in Visual Basic for Applications (VBA), are key components of this architecture [5]. They can be recorded or manually written to automate tasks within Excel, including operations on cells and ranges, data manipulation using formulas, and interaction with workbook elements.

Supporting macro execution is the macro environment, which includes the Visual Basic Editor (VBE), a dedicated environment for VBA code development, editing, and debugging. Additionally, macro code libraries store reusable code modules or functions that macros can call upon to accomplish specific tasks efficiently.

In summary, the architecture of Excel macros provides a structured framework for task automation and workflow optimization within Excel. Leveraging these components, users can improve productivity and efficiency in managing and analysing data within Excel workbooks.

II. FEATURES OF SQL

- A. *Grid Interface*: Excel employs a grid layout comprising cells arranged in columns and rows, accommodating text, numbers, or formulas within each cell.
- B. *Formulas and Functions*: Users leverage Excel to execute calculations using an array of formulas and functions, facilitating intricate mathematical and logical operations for data analysis and manipulation.
- C. *Charts and Graphs*: Excel furnishes tools for crafting diverse charts and graphs to visually illustrate data, spanning bar charts, line graphs, pie charts, and more.
- D. *Data Analysis Tools*: Excel integrates features like pivot tables, sorting, filtering, and conditional formatting, empowering users to effectively analyze and visualize data.
- E. *Data Import and Export*: Users harness Excel's capability to import data from varied sources, encompassing databases and external files, with provisions for exporting data to different formats for sharing or integration with other applications.
- F. *Collaboration*: Excel fosters collaboration through functionalities like comments, sharing options, and co-authoring, facilitating simultaneous work on a single workbook by multiple users.
- G. *Automation with Macros*: Excel facilitates automation through Visual Basic for Applications (VBA),

empowering users to create macros that automate repetitive tasks and tailor Excel's functionality to suit specific requirements.

- H. *Data Validation*: Excel equips users with tools to establish rules and constraints on data entry, ensuring data precision and uniformity.
- I. *Templates*: Excel boasts an array of templates catering to common tasks such as budgeting, invoicing, calendars, and more, providing users with a foundational framework to create their own documents.
- J. *Security Features*: Excel incorporates features like password protection, encryption, and access controls to safeguard sensitive data against unauthorized access.
- K. *What-If Analysis*: Users leverage Excel for what-if analysis, altering input values to observe their impact on calculated outcomes, aiding decision-making and scenario planning endeavours.

III. MATERIAL AND METHODS

In modern business landscapes, organizations are confronted with the challenge of efficiently managing vast amounts of data while executing repetitive tasks. Visual Basic for Applications (VBA) macros within Microsoft Excel present a robust toolset that empowers users to automate tasks, retrieve data, and perform analysis, thereby enhancing productivity. Among the various methods employed for data lookup and consolidation, the VLOOKUP function in Excel stands out as a commonly utilized tool[11].

This problem statement aims to delve into several key aspects:

- A. *Detailed Analysis of Large Dataset of Industrial Spreadsheets*: The focus is on thoroughly examining a substantial dataset comprising industrial spreadsheets. This analysis involves scrutinizing various parameters, including transactional data, financial records, and operational metrics[6].
- B. *Examination of Function Utilization in Business Spreadsheets*: A comprehensive evaluation is conducted to understand how functions are leveraged within spreadsheets in a business context. This examination encompasses the utilization of built-in functions, custom formulas, and automation techniques to streamline processes and extract meaningful insights from the data.
- C. *Comparison of Dataset Characteristics*: A comparative analysis is undertaken to discern the distinct characteristics of different datasets present within the spreadsheets. This involves identifying similarities, disparities, and trends across various datasets, shedding light on their respective implications for decision-making and strategic planning [15].
- D. *Filtering and Sorting Data with VBA Macros and VLOOKUP Automation*: The utilization of VBA macros and VLOOKUP automation is explored for filtering and sorting datasets. Specifically, the datasets under consideration pertain to bank accounts and their associated transactions, encompassing debits and credits[3]. The spreadsheet comprises three worksheets, namely 'ALL TRANSFERS,' 'CREDITS,' and 'DEBITS'.

In the 'ALL TRANSFERS' worksheet, detailed information regarding bank users is provided, including Account Number, Identification Number, Date of Transactions, Type of Transaction (Debit/Credit), Transaction Details, Operating Number, and Value. The primary task entails sorting and filtering the data based on the type of transactions, specifically debits and credits.

The VLOOKUP function is instrumental in this process, serving multiple purposes:

- E. *Searching Data Transactions Based on Value Range*: VLOOKUP is employed to search for data transactions with values greater than or equal to 1 or less than or equal to 1, thereby segregating transactions into credits and debits[13].
- F. *Matching Data of Transaction Details with Worksheets for Debits/Credits*: The function is utilized to match the data of transaction details with the corresponding worksheets for debits and credits. This matching process is facilitated by using the unique data type of Operation Number as the lookup value in VLOOKUP.

Overall, the application of VBA macros and VLOOKUP automation streamlines the sorting, filtering, and analysis of large datasets within Microsoft Excel[1]. By leveraging these tools effectively, organizations can enhance efficiency, accuracy, and decision-making capabilities in handling complex data structures and business processes.

V. PROBLEM STATEMENTS

In the realm of data management, organizations face the challenge In modern business landscapes, organizations grapple with the challenge of efficiently managing extensive datasets and streamlining repetitive tasks. Visual Basic for Applications (VBA) macros present a potent toolset within Microsoft Excel, facilitating task automation, data retrieval, and analysis, thereby enhancing productivity. One prevalent method employed for data lookup and consolidation is the utilization of the VLOOKUP function within Excel.

This problem statement aims to delve into:

- A. A comprehensive analysis of large industrial spreadsheet datasets.
- B. Examination of the utilization of functions within spreadsheets in a business context.
- C. Comparison of distinct characteristics across different spreadsheet datasets.
- D. Application of VBA macros for filtering and sorting data, alongside VLOOKUP automation, within datasets comprising bank accounts and associated transactions, including debits and credits.

The spreadsheet comprises three distinct worksheets: 'ALL TRANSFERS', 'CREDITS', and 'DEBITS'. Within the 'ALL TRANSFERS' worksheet, data pertaining to bank users is provided, encompassing Account Number, Identification number, Transaction Date, Transaction Type (Debit/Credit), Transaction Details, Operating Number, and Value [10]. The objective involves sorting and filtering this data based on transaction types, namely DEBITS and CREDITS.

VLOOKUP is employed to accomplish the following tasks:

- E. Search for transaction data with values falling within the range of greater than or equal to 1 or less than or equal to 1 as shown in figure no 2.
- F. Match transaction details based on values with data within the DEBITS/CREDITS worksheets. For this search and match process, the Operation Number serves as a unique identifier as shown in figure no 3 and figure no 4.

In the VLOOKUP function, the Operation Number serves as the lookup value, facilitating the retrieval and matching of relevant data.

ACCOUNT NUMBER	IDENTIFICATION NUMBER	DATE OF TRANSACTION	TYPE	TRANSACTION DETAILS	OPERATING NUMBER	VALUE
95004210000418	2201900191796051211	2020/10/23	D	MOBILE BANKING	15104710	1.5
95004210000418	2201900191796051211	2020/10/20	D	DEPOSITS	40004133	1.5
95004210000418	2201900191796051211	2020/10/07	D	CASH	14800206	4.2
95004210000418	2201900191796051211	2020/10/07	D	CASH	14800304	4.45
95004210000418	2201900191796051211	2020/10/07	D	CASH	14800441	40.45
95004210000418	2201900191796051211	2020/10/21	D	CASH	21105083	49.37
95004210000418	2201900191796051211	2020/10/18	D	CASH	4588788	45.08
95004210000418	2201900191796051211	2020/10/13	D	INTERNET BANKING	17981927	1.7
95004210000418	2201900191796051211	2020/06/09	D	INTERNET BANKING	17289375	58.3
95004210000418	2201900191796051211	2020/07/20	D	INTERNET BANKING	5021869	548.27
95004210000418	2201900191796051211	2020/07/21	D	MOBILE BANKING	4190444	148.74
95004210000418	2201900191796051211	2020/07/14	D	MOBILE BANKING	6760088	0.08
95004210000418	2201900191796051211	2020/09/07	D	INTERNET BANKING	60404863	6.9
95004210000418	2201900191796051211	2020/10/13	D	INTERNET BANKING	6450388	12.36
95004210000418	2201900191796051211	2020/10/27	D	MOBILE BANKING	6231572	1.75
95004210000418	2201900191796051211	2020/10/05	D	INTERNET BANKING	66443560	1794.58
95004210000418	2201900191796051211	2020/10/21	D	DEPOSITS	7347136	8
95004210000418	2201900191796051211	2020/10/21	D	DEPOSITS	7347144	8
95004210000418	2201900191796051211	2020/10/21	D	DEPOSITS	7347156	8
95004210000418	2201900191796051211	2020/08/25	D	CHECKS	68889789	12.050
95004210000418	2201900191796051211	2020/01/02	D	CHECKS	42762877	7.96
95004210000418	2201900191796051211	2020/01/02	D	CHECKS	43044113	1.5

Figure 2: Data for all Transfers

ACCOUNT NUMBER	IDENTIFICATION NUMBER	DATE OF TRANSACTION	TYPE	TRANSACTION DETAILS	OPERATING NUMBER	VALUE
95004210000418	2201900191796051211	2020/10/20	D	DEPOSITS	40004133	1.5
95004210000418	2201900191796051211	2020/10/13	D	CASH	21105083	49.37
95004210000418	2201900191796051211	2020/10/18	D	CASH	4588788	45.08
95004210000418	2201900191796051211	2020/10/21	D	INTERNET BANKING	17981927	1.7
95004210000418	2201900191796051211	2020/06/09	D	INTERNET BANKING	17289375	58.3
95004210000418	2201900191796051211	2020/07/20	D	INTERNET BANKING	5021869	548.27
95004210000418	2201900191796051211	2020/07/21	D	MOBILE BANKING	4190444	148.74
95004210000418	2201900191796051211	2020/07/14	D	MOBILE BANKING	6760088	0.08
95004210000418	2201900191796051211	2020/09/07	D	DEPOSITS	60404863	6.9
95004210000418	2201900191796051211	2020/10/21	D	DEPOSITS	7347136	8

Figure 3: Data Of Credited Transactions

ACCOUNT NUMBER	IDENTIFICATION NUMBER	DATE OF TRANSACTION	TYPE	TRANSACTION DETAILS	OPERATING NUMBER	VALUE
95004210000418	2201900191796051211	2020/10/23	D	MOBILE BANKING	15104710	1.5
95004210000418	2201900191796051211	2020/10/20	D	INTERNET BANKING	66443560	1794.58
95004210000418	2201900191796051211	2020/10/21	D	CHECKS	7347758	5.2
95004210000418	2201900191796051211	2020/08/25	D	CHECKS	5848340	4000

Figure 4: Data of Debited Transaction

VI. LITERATURE STUDIES

Excel enjoys extensive utilization across diverse sectors such as business, finance, education, research, and beyond, owing to its adaptability and robust functionalities. It has emerged as a staple tool for professionals necessitating structured and systematic data management, analysis, and presentation [14].

In various industries and professions, Microsoft Excel stands out as a versatile and prevalent spreadsheet software. Its real-world applications include:

- A. **Financial Analysis and Budgeting:** Excel sees extensive use in financial modeling, budgeting, and forecasting. Functions like NPV, IRR, and financial formulas aid in investment analysis. Visualization of financial data is facilitated through pivot tables and charts.
- B. **Business and Project Management:** Excel serves as a project management tool, enabling the creation of Gantt charts, timelines, and tracking project milestones. Task lists, progress trackers, and resource allocation sheets streamline project workflows.
- C. **Data Analysis and Visualization:** Excel serves as a powerful tool for analyzing and visualizing data using charts, graphs, and dashboards. Pivot tables empower users to quickly summarize and analyze large datasets.
- D. **Inventory Management:** Excel is employed for inventory tracking, managing stock levels, and generating

reports on stock movements. Formulas and conditional formatting can be utilized to set up alerts for low inventory levels.

- E. *Human Resources*: Excel is utilized for managing employee data, tracking attendance, and calculating payroll. Workforce demographics and performance metrics can be analyzed using pivot tables.
- F. *Sales and Marketing*: Excel aids in tracking sales leads, managing customer data, and analyzing sales performance. Marketing teams utilize Excel for campaign tracking, ROI analysis, and customer segmentation.
- G. *Educational Institutions*: Teachers and educators utilize Excel for grade tracking, lesson planning, and creating educational resources. Student performance analysis can be conducted using data validation and conditional formatting.
- H. *Scientific Research*: Researchers rely on Excel for data collection, statistical analysis, and graphing experimental results. Statistical functions like regression analysis and t-tests support scientific studies.
- I. *Healthcare and Biotechnology*: Excel is employed for managing patient records, tracking medical expenses, and creating healthcare budgets. Biotechnologists use Excel for data analysis and experimental planning.
- J. *Personal Finance*: Individuals utilize Excel for personal budgeting, expense tracking, and investment portfolio management. Financial calculators and goal trackers aid in long-term financial planning.
- K. *Supply Chain Management*: Excel is used to manage supply chain processes, track shipments, and analyze procurement data[2]. Identifying bottlenecks and optimizing logistics is facilitated through formulas and conditional formatting.
- L. *Quality Control and Six Sigma*: Excel finds application in statistical analysis for quality control processes. Six Sigma professionals utilize Excel for data-driven decision-making to drive process improvement.

The adaptability and intuitive interface of Microsoft Excel render it indispensable for professionals across various domains, underscoring its extensive real-world applicability.

VI. SOLUTION

The Creating macros in Excel involve two primary methods: recording a macro and writing a macro using VBA (Visual Basic for Applications). Both methods aim to automate repetitive tasks, each with its own characteristics and applications.

- A. *Recording a Macro*: Recording a macro is the simpler method and requires no programming knowledge. It is ideal for straightforward, repetitive tasks. Excel records the actions performed, generating a macro that can replicate these actions. To begin recording a macro, go to the 'Developer' tab in Excel, select 'Record Macro', provide a name for the macro, and perform the actions to be recorded. Upon completion, click 'Stop Recording'. The macro is then accessible through the 'Macros' option in the 'Developer' tab.
- B. *Writing a Macro using VBA (Visual Basic for Applications)*: Writing a macro using VBA offers greater flexibility and control, enabling the creation of more complex macros. This method requires a basic understanding of VBA, Excel's programming language [12]. To create a VBA macro, navigate to the 'Developer' tab, select 'Visual Basic', and then 'Insert' > 'Module'. This opens a blank module where you can write your VBA code. After writing the code, press 'Ctrl + S' to save and then 'Ctrl + Q' to close the VBA editor [4]. Your VBA macro can be executed from the 'Macros' option in the 'Developer' tab.

Syntax:

FOR LOOP:

Loops allow you to iterate through a set of objects or values, analyzing them individually and performing specific tasks for each iteration[15].

For Counter = Start To End [Step Value]

[Code Block to Execute]

Next [Counter]

IF Functions:

IF function is utilized to evaluate whether a condition is true or false for a given value. It returns one result if the condition is true and another if false. This function is useful for comparisons and error detection.

=IF(logical_test, value_if_true, [value_if_false])

VLOOKUP:

VLOOKUP is employed to search for specific information within a spreadsheet[9]. It is used to find data in a table or range by row.

=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

- `lookup\_value`: The value being searched for, which could be text, number, or a single cell reference.
- `table\_array`: The range where the lookup will be performed, starting from the column containing the value and including the column with the result.
- `col\_index\_num`: The column number from which the result should be returned, relative to the first column in the selected range.
- `[range\_lookup]`: The range lookup method to be used. 0 for "Exact Match" and 1 for "Approximate Match" (not recommended).

These functionalities enhance Excel's capabilities, allowing users to automate tasks and perform complex data manipulations efficiently.

The VBA code begins with the 'Sub' command, followed by integers. Within this code:

- The 'H' column in the first worksheet 'ALL TRANSFERS' is converted to the 'General' format[3].
- The code counts the range of all columns and rows containing data in their cells, starting from column A.
- The cursor is positioned in column H and the 4th row (H4).
- A 'For' loop is initiated from cell H4 to the last row of column H.
- Within this loop: The VLOOKUP function is applied to each cell of column H.

An 'IF' condition is introduced to check the 'Value' column for debited and credited transaction types. The logical test verifies if the value in the 'Value' column cell is greater than or equal to 1 or less than or equal to -1. If this condition is met, VLOOKUP is applied to that cell using the 'Operation Number' as the lookup value to identify valid transactions.

Additionally, it verifies whether the 'Operation Number' of a valid transaction matches the data from the 'ALL TRANSFERS' worksheet with the 'CREDITED' and 'DEBITED' worksheets. If the data is present in the 'Debit/Credit' worksheet, the 'Operation Number' of that transaction is printed in the 'H' column of the 'ALL TRANSFERS' worksheet. If the data is absent, '#N/A' is printed.

If the condition is false, the cell remains blank, and the code moves to the next cell. Once this process is completed for all rows of column H, the 'For' loop concludes, and the program ends with the 'End' command. This process is explained in figure no. 5.

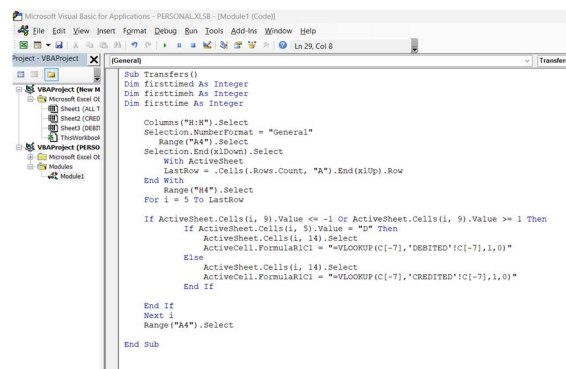


Figure 5: Implementation of Proposed Solution

VII. RESULTS

The data from the 'ALL TRANSFERS' worksheet undergoes sorting and matching. Following the execution of the macro, the resulting output is visible in the H column. It is shown in figure no. 6.

ACCOUNT NUMBER	IDENTIFICATION NUMBER	DATE OF TRANSACTIONS	TYPE	TRANSACTION DETAILS	OPERATING NUMBER	VALUE	RESULT
P050421000418	P01001917865171	2020/10/23	D	MOBILE BANKING	15316710	-12	#N/A
P050421000418	P01001917865171	2020/03/02	C	DEPOSITS	48504133	1.5	#N/A
P050421000418	P01001917865171	2020/03/07	D	CASH	14850206	-0.3	
P050421000418	P01001917865171	2020/03/07	D	CASH	14850304	0	
P050421000418	P01001917865171	2020/03/07	D	CASH	14850441	-0.45	
P050421000418	P01001917865171	2020/03/12	C	CASH	21105083	49.37	21105083
P050421000418	P01001917865171	2020/03/13	C	CASH	4588788	24.08	4588788
P050421000418	P01001917865171	2020/06/13	D	INTERNET BANKING	17861877	1.4	17861877
P050421000418	P01001917865171	2020/06/09	C	INTERNET BANKING	17202176	1.84	17202176
P050421000418	P01001917865171	2020/07/10	D	INTERNET BANKING	4023803	-140.27	4023803
P050421000418	P01001917865171	2020/07/21	C	INTERNET BANKING	410644	146.34	410644
P050421000418	P01001917865171	2020/08/14	C	MOBILE BANKING	28765088	0.88	
P050421000418	P01001917865171	2020/08/14	C	INTERNET BANKING	40404603	0.9	
P050421000418	P01001917865171	2020/10/13	C	INTERNET BANKING	14350382	43.16	14350382
P050421000418	P01001917865171	2020/10/27	C	MOBILE BANKING	6213377	14.75	#N/A
P050421000418	P01001917865171	2020/10/05	C	DEPOSITS	66441160	1784.58	66441160
P050421000418	P01001917865171	2020/02/21	C	DEPOSITS	7447116	2	#N/A
P050421000418	P01001917865171	2020/02/21	C	DEPOSITS	7447434	2	#N/A
P050421000418	P01001917865171	2020/02/21	C	DEPOSITS	7447176	2	#N/A
P050421000418	P01001917865171	2020/02/21	D	CHEQUES	7347718	-2.52	#N/A
P050421000418	P01001917865171	2020/08/25	D	CHEQUES	14684749	-29800	#N/A
P050421000418	P01001917865171	2020/01/02	C	CHEQUES	47462877	4.48	#N/A
P050421000418	P01001917865171	2020/01/02	C	CHEQUES	69020133	11.5	#N/A

Figure 6: Sorting and Matching of All Transfer sheet

The sorted data is appended to the 'DEBITED' worksheet after conducting sorting and matching operations based on the 'OPERATION NUMBER'. Records in the 'H' column containing '#N/A' denote transactions that have been successfully matched with those in the 'ALL TRANSFERS' worksheet[11], as shown in figure no 7 and figure no 8.

[illegible]

Figure 7: Sorting and Matching of Credited sheet

A	B	C	D	E	F	G	H
DEBIT							
ACCOUNT NUMBER	IDENTIFICATION NUMBER	DATE OF TRANSACTION	TYPE	TRANSACTION DETAILS	OPERATING NUMBER	VALUE	RESULT
26504210002418	230156029179653721	2020/02/23	D	MOBILE BANKING	25261570	-12	232167
26504210046753	230156029179653721	2020/10/05	D	INTERNET BANKING	86442250	-1794.50	86442250
26504210046753	230156029179653721	2020/03/21	D	CHEQUES	7347759	-5.2	7347759
26504210046753	230156029179653721	2020/08/25	D	CHEQUES	56843740	-1900	1840407
26504210002418	230156029179653721	2020/07/10	D	INTERNET BANKING	2023383	-149.27	49474
< > ALL TRANSFERS DEBITED +							

Figure 8: Sorting and Matching of Debited sheet

Detailed Analysis of Large Dataset: The primary focus is on scrutinizing a substantial dataset comprised of industrial spreadsheets. These spreadsheets contain intricate details concerning bank accounts and transactions, encompassing both debits and credits.

- A. *Function Usage in Business Spreadsheets:* A meticulous examination is conducted to elucidate the utilization of functions within business spreadsheets. Particular emphasis is placed on the VLOOKUP function within Microsoft Excel, exploring its role in data lookup and consolidation.
- B. *Comparison of Dataset Characteristics:* A comparative analysis is undertaken to discern distinctive characteristics across various datasets within the spreadsheets. This comparative approach aims to unveil patterns, trends, or anomalies inherent in the data.
- C. *Filtering and Sorting Data with VBA Macros and VLOOKUP:* The utilization of VBA macros and the VLOOKUP function is employed to filter and sort data within the spreadsheets. The primary objective is to segregate data into two distinct categories: debits and credits. The filtering criteria entail utilizing the VLOOKUP function to search for transactions with values greater than or equal to 1 or less than or equal to 1. The "Operation Number" serves as the unique identifier for this search and match task.
- D. *Data Structure:* The dataset is organized across three distinct worksheets: 'ALL TRANSFERS,' 'CREDITS,' and 'DEBITS.' The 'ALL TRANSFERS' worksheet encompasses comprehensive data pertaining to bank users, encompassing Account Number, Identification number, Transaction Date, Transaction Type (Debit/Credit), Transaction Details, Operating Number, and Value.
- E. *VLOOKUP Details:* The VLOOKUP function is harnessed for two primary purposes: Searching for Data Transactions based on specific value criteria.
- F. Matching transaction details with data housed within the 'DEBITS' and 'CREDITS' worksheets.
- G. The unique identifier, or lookup value, utilized for the VLOOKUP function is the "Operation Number."

In summary, the problem statement addresses the hurdles encountered by organizations in managing and analyzing extensive datasets within industrial spreadsheets [8]. It underscores the significance of employing VBA macros and the VLOOKUP function to streamline automation, data retrieval, and analysis processes. Specifically, the focus lies on efficiently filtering and sorting bank transaction data according to debit and credit criteria.

VIII. CONCLUSION

In conclusion, Visual Basic for Applications (VBA) macros and VLOOKUP in Excel are vital for managing large data volumes and repetitive tasks in modern business. Analyzing industrial spreadsheets, focusing on business functions, and comparing datasets highlight the importance of efficient data consolidation. The problem statement revolves around automating sorting and filtering of bank transactions[7]. With three worksheets ('ALL TRANSFERS', 'CREDITS', 'DEBITS') and VLOOKUP, data is organized by transaction type for streamlined analysis. The unique identifier, Operation Number, ensures precise data processing. VLOOKUP efficiently

searches and matches transaction details, enhancing productivity and informed decision-making in business operations.

REFERENCES

- [1] Karlekar, Prachi V., Swapna Choudhary, Atul Deshmukh, and Harish Banote. "Design of an Efficient Bioinspired Model for Optimizing Robotic Arm Movements via Ensemble Learning Operations." In 2023 IEEE 8th International Conference for Convergence in Technology (I2CT), pp. 1-6. IEEE, 2023.
- [2] Wankhade, K.K., Jondhale, K.C. and Dongre, S.S., 2021. A clustering and ensemble based classifier for data stream classification. *Applied Soft Computing*, 102, p.107076.
- [3] Dhule, Chetan, Rahul Agrawal, Sanjay Dorle, and Bhushan Vidhale. "Study of design of IoT based digital board for real time data delivery on national highway." In 2021 6th International Conference on Inventive Computation Technologies (ICICT), pp. 195-198. IEEE, 2021.
- [4] Kothare, Akash, Shridhara Chaube, Yash Moharir, Gaurav Bajodia, and Snehlata Dongre. "SynGen: Synthetic Data Generation." In 2021 International Conference on Computational Intelligence and Computing Applications (ICCICA), pp. 1-4. IEEE, 2021.
- [5] Charkha, Pranav G., and Santosh B. Jaju. "Decision support system for supply chain performance measurement: case of textile industry." *New Paradigm of Industry 4.0: Internet of Things, Big Data & Cyber Physical Systems (2020)*: 99-131.
- [6] Dafare, Mayur, Sandesh Waghmare, Abhijeet Bhoyar, Abhijit S. Titarmare, and Pankaj Chandankhede. "LoRa-Enabled Smart RS485 Data Logger and MQTT Gateway for Industrial IoT Applications Using ESP32." In 2023 International Conference on Circuit Power and Computing Technologies (ICCPCT), pp. 1297-1302. IEEE, 2023.
- [7] Kumbhare, Bhuvana, Kalyani Akant, Milind Khanapurkar, and Pankaj Chandankhede. "Longitudinal Control for closed loop simulation of Autonomous driving Vehicle." In 2023 International Conference on Emerging Smart Computing and Informatics (ESCI), pp. 1-4. IEEE, 2023.
- [8] Dupare, Shreyash, Yugant Moundekar, and Pankaj Chandankhede. "Implementation of Smartphone Based Activity Recognition." In 2023 International Conference for Advancement in Technology (ICONAT), pp.1-5.IEEE,2023.
- [9] Tiple, Rani C., Gopal S. Rathod, Kalyani Akant, Pankaj Chandankhede, and Santosh Yadav. "Hybrid Approach for Weather Prediction in IoT Network." In 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT), pp. 812-819. IEEE, 2023.
- [10] Kolhe, Pranita, Aniket Baseshankar, Mansi Murekar, Shubham Sadhankar, Kamlesh Kalbande, and Atul Deshmukh. "Smart Communication System for Agriculture." In 2022 Third International Conference on Intelligent Computing Instrumentation and Control Technologies (ICICICT), pp. 1122-1126. IEEE, 2022.
- [11] Chinchankar, Akshay, Pankaj H. Chandankhede, and Abhijit Titarmare. "Design of Binary Neural Network Soft System for Pattern Detection using HDL Tool." In 2023 7th International Conference on Computing Methodologies and Communication (ICCMC), pp. 393-398. IEEE, 2023.
- [12] Amita Biswal, J. Subhashini, and Ajit Kumar "Air Quality Monitoring System for Indoor Environments using IoT" The 11th National Conference on Mathematical Techniques and Applications AIP Conf. Proc. 2112, 020180-1–020180-11.
- [13] Md. Nazrul Islam, Mohammad Arafin Rahman, Kazi Muhammad Asif Ashrafi and Toufiq Ahmed "Development of an IOT Based Industrial Fault Detection and Diagnosis System" Asian Journal of Convergence in Technology ISSN NO: 2350-1146 I.F-5.11.
- [14] Zumyla Shanaz F, Prem Kumar S R, Rahul R, Rajesh Kumar M, Santhosh Kumar C, "IoT based Industrial Pollution Monitoring System" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056. Zade, Nikhil, and Kapil Jajulwar. "Performance Analysis of Paper Cup Machine Using Capacitive Sensor for Industry Automation." In 2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT), pp. 1-4. IEEE, 2021.