Bulletin of Computer Science and Electrical Engineering
Vol. 4, No. 2, December 2023, pp. 65~76
ISSN: 2722-7324, DOI: 10.25008/bcsee. v4i1.1183

Implementation of the Waterfall Method in Designing and Building an Income and Cost Management Information System (Case study: Limited Liability Company Adau Kapuas)

Nanda Diaz Arizona[1], Yulia[2] , Rabiatul Adwiya[3]
[1 2.3] Department of Accounting Information Systems, Universitas Bina Sarana Informatika, Indonesia

Article Info

Article history:

Received Oct 10, 2023
Revised Dec 09, 2023
Accepted Dec 30, 2023

Keywords:

Applications at Coffee Shops
Apriori Algorithm
Web Based Rapid application development method

ABSTRACT

Adau Kapuas is a company operating in the transportation services sector. In processing income and costs, Adau Kapuas Limited liability companies still use bookkeeping as a data collection medium, such as recording payment and expenses, which are processed starting from recording ticket sales and goods delivery transactions, which process passenger data and goods delivery data. The income obtained from tickets and delivery of goods and the total costs are then entered back into the computer. This proves the difficulty faced by Adau Kapuas, namely having to do work twice daily. This research discusses the application of income and cost processing at Adau Kapuas Pontianak. This application was designed using Netbeans IDE 8.2. It can process admin data, types of goods, types of income, costs, bus classes, destinations, ticket sales transactions, delivery of goods, income transactions, and cost transactions. The reports produced by this application include ticket sales reports, goods delivery reports, income reports, and cost reports. With the income and expense processing application, it is hoped that it can support the performance of Adau Kapuas Pontianak in processing income and expense transactions and presenting reports more easily, quickly, and accurately.

Corresponding Author:

Nanda Diaz Arizona,
Department of Accounting Information Systems, Universitas Bina Sarana Informatika, Indonesia
Email: nanda.ndz@bsi.ac.id

1. INTRODUCTION

Transportation is a means of traveling [1] Transportation plays an important role in the functioning of society as it facilitates the mobility of users and goods, the provision of essential services, and the achievement of economic prosperity [2] Logistics and transportation companies play an important role in the economy [3], because the speed, cost and quality of goods distribution are adjusted to consumer demand [4][5].

Adau Kapuas was founded in Pontianak on Monday, January 5, 1998. Adau Kapuas is a company that operates in the service sector, namely transportation services, which uses buses as its medium. At the beginning of its establishment, Adau Kapuas, commonly known as Adau Transport Service (ATS), only relied on a fleet of 3 buses. These three buses were used to serve Sintang-Nanga

Pinoh-Nanga Mahap PP transportation. On October 1, 2015, Adau Kapuas changed the vehicle list by adding 5 units to the bus fleet. In terms of fleet, ATS buses are easy to recognize because they always maintain their distinctive characteristics, whereas, from the beginning of their establishment, ATS has been dominant in wearing a combination of white and purple and accompanied by the writing ATS. Of course, Adau Kapuas always pays attention to the comfort of its passengers. Apart from opening economy class buses, Adau Kapuas added several Royal Class and Excexutive bus fleet units.

In processing income and costs, Adau Kapuas still uses a manual system recorded in books as a data collection medium, such as documenting income and expenses, which are processed starting from transactions for recording ticket sales and goods delivery [6], which processes passenger data and goods delivery data. after office hours, the data collection results on passenger income, delivery of goods, and costs are totaled and then entered back into the computer . This proves the difficulty experienced by Adau Kapuas, namely, having to work twice daily. In this case, the author tries a computerized income and cost processing program [7] [8], which can process data on passengers, delivery of goods, payment, and costs and make reports of all transactions that will be processed using a computer [9].

2. RESEARCH METHOD

2.1 Data Collection Methods

Data collection is very important in research because data is needed for the data [10] Some techniques used in this research, among others:

1. Observation

   Observations were made to observe sales procedures that occurred both at the store and orders through social media. This is done to find facts that support the information obtained at the interview stage.

2. Interview

   Interviews were conducted using open interview techniques. This was done so that the informant felt comfortable during the interview session, did not feel awkward, did not feel restricted, and could provide detailed information.

3. Study library

   Literature study is carried out by studying electronic journals, books, and final assignments that are relevant to this research. Literature study was conducted to find variations of solutions that could be made for similar problems. Literature study was obtained from e-journal and reporsitory sites of various universities.

2.2 Software Development Methods

Researchers used the waterfall method to design an Accounting Information System for Savings and Loans Data Processing at the Adau Kapuas [11] [12].

The stages of software development using the waterfall method can be described as follows[13] [14]:

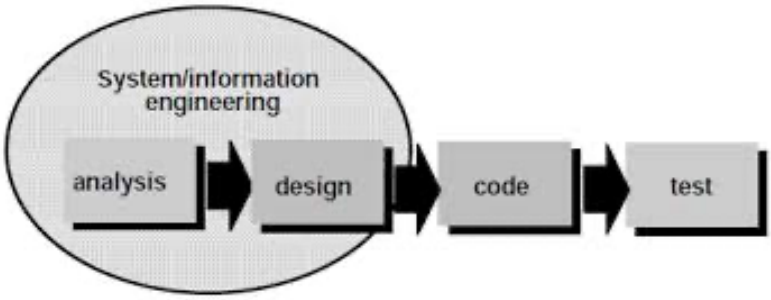

Figure 1. Waterfall Method

1. Needs Analysis
   This is the first stage when the author comes to Adau Kapuas and asks what systems are needed for companies engaged in savings and loan cooperatives [15]. Deposit and loan transactions.
2. Design
   In this design stage, a multi-step process focuses on the design of making applications based on the results of the data obtained from the analysis stage, which will later be implemented [16]. At this design stage, Entity Relationship Diagrams (ERD) and Logical Record Structures (LRS) are used for modeling database designs [17], and Unified Model Language (UML) diagram modeling [18], which consists of several diagrams, namely use case diagrams, activity diagrams, sequence diagrams, class diagrams, and deployment diagrams [19][20].
3. Code Program
   In this stage, continue coding the program using the hypertext preprocessor (PHP) programming language, and Sublime Text as a text editor, and XAMPP, which is an application package containing Apache, MySQL [21].
4. Testing
   The testing stage is carried out so that the application[22], whether there are program defects in each form, or there are no errors, then the application that has been made is feasible for the user to implement.

3. RESULTS AND DISCUSSION

3.1. Activity Diagrams

Activity diagrams describe user activities on the system created [19] [22], describe how an activity starts, decisions and conditions are formed, and how the system responds.

1. Entry Activity Diagram

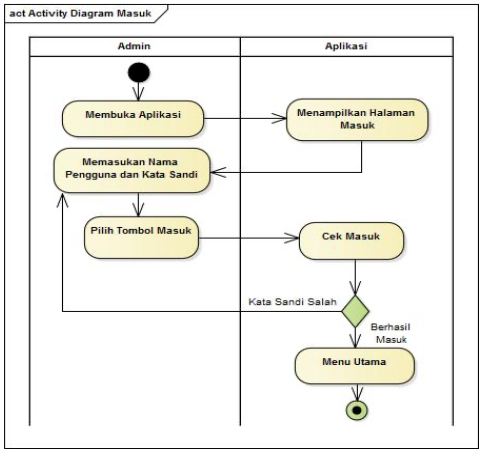

Figure 2. Entry Activity Diagram

In figure 1. the login activity diagram can be explained that the admin opens the application, the login page appears, and before entering the main menu, the admin must enter the username and password and select the login button. If the username or password is correct, it will display a successful login message and display the main menu. If the username or password is incorrect, the program will display the incorrect password and return to the login page.

2. Activity Diagram Processing Admin

The following is an overview of the lending business process modeled in the form of an activity diagram. The results of the lending business process modeling can be seen in Figure III.2

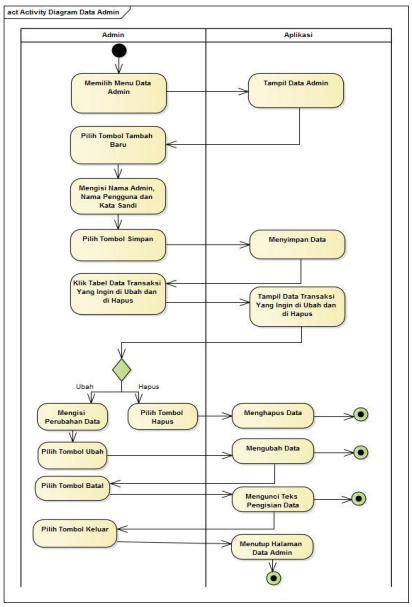

Figure 3. Activity Diagram Processing Admin

In Figure 3. Activity Diagram for admin data, it is explained that when the admin selects the admin data menu, the application will display the admin data page. To add data, the admin must select the add new button, the admin fills in the admin data, then select the save button, and the application will save the data. If you want to change or delete data, the admin clicks on the transaction data table that you want to change or delete fills in the changes, and then selects the change button. The application will change the data and select the delete button. The application will delete the data, select the cancel button if the transaction is not carried out, the application automatically will lock the data entry text, the admin selects the exit button, and the application close the admin data page.

3. Activity Diagram Processing Income Type

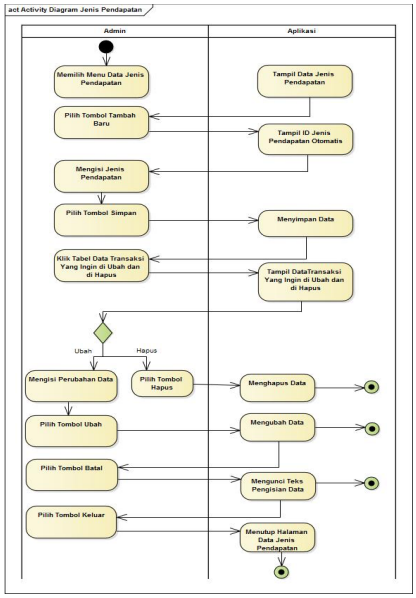

Figure 4. Activity Diagram Processing Income Type

In Figure 4. Activity Diagram of income type data, it is explained that when the admin selects the income type menu, the application will display the income type data page. To add data, the admin must select the add new button, the application displays the income type ID automatically, the admin fills in the income type data, then selects the save button, and the application will saves the data. If you want to change or delete data, the admin clicks on the transaction data table that you want to change or delete fills in the changes, and then selects the change button. The application will change the data. Select the delete button, the application will delete the data. Select the cancel button if the transaction is not carried out, the application automatically will lock the data entry text. The admin selects the exit button, and the application closes the income type data page.

4. Activity Diagram Processes Costs

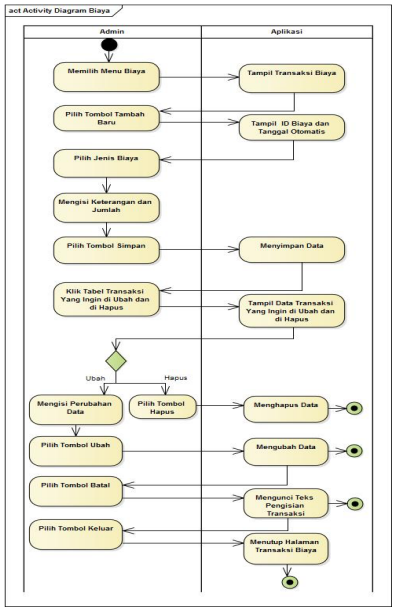

Figure 5. Activity Diagram Processes Costs

In Figure 5. The cost transaction activity diagram explains that the admin enters the cost transaction menu, and the application displays the cost transaction [23]. The admin must select the add new button to add or make a transaction. The application displays the cost ID and date automatically, the admin fills in the transaction data, then selects the button save, and the application will save the transaction data. If you want to change or delete transaction data, the admin clicks on the transaction data table that you want to change or delete, fills in the changes, then selects the change button, and the application will change the data. Select the delete button. The application will delete the data. Select the cancel button. If the transaction is not carried out, the application will automatically lock the transaction filling text, the admin selects the exit button, and the application closes the fees page.

3.2. Software Requirements Analysis

Functional requirements describe the types of requirements that contain any processes that can later be carried out by the system [20], also contain what information must exist and be produced by the system.

A.1. Admin logs in
A.2. Admin accesses the data menu
A.2.1. Manage admin data menu
a. Can add admin data

b. Can save admin data
c. Can change admin data
d. Can delete admin data
e. Can cancel admin data
f. Go out

A.2.2. Manage item type data menu
a. Can add item type data
b. Can store item type data
c. Can change item type data
d. Can delete item type data
e. Can cancel item type data
f. Go out

A.2.3. Manage the income type data menu
a. Can add data on types of income
b. Can store income type data
c. Can change income type data
d. Can delete income type data
e. Can cancel income type data
f. Go out

A.2.4. Manage cost type data menu
a. Can add cost type data
b. Can store cost type data
c. Can change cost type data
d. Can delete cost type data
e. Can cancel cost type data
f. Go out

A.2.5. Manage bus class data menu
a. Can add bus class data
b. Can store bus class data
c. Can change bus class data
d. Can delete bus class data
e. Can cancel bus class data
f. Go out

3.3. Designing Use Case Diagrams

Use case diagrams are used to show in general the functions and responsibilities of each actor in the coffee sales application [24] [25]. The use case diagram below describes the functions available to the cashier actor and the owner actor.

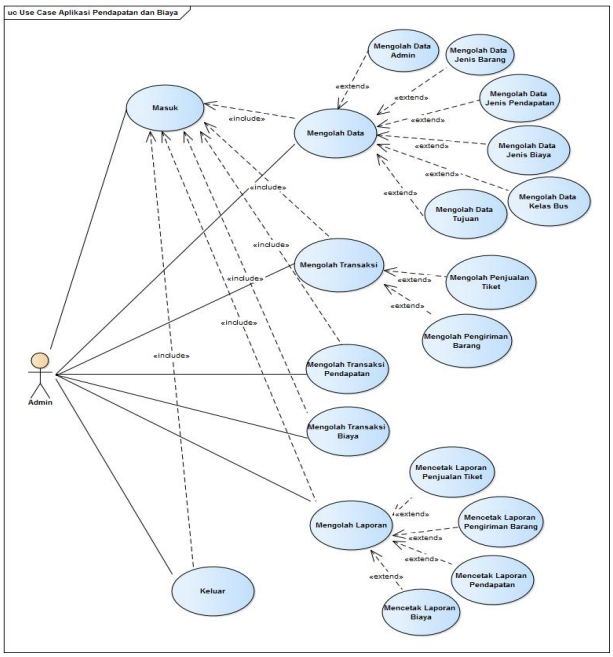

Figure 6. Use Case Diagrams

In Figure 6. Use Case Income and Cost Diagram, and it is explained that there is one level, namely the admin, who has all access rights to the income and cost application starting from the entry process, processing data, which includes admin data, item type data, income type data, type data. Costs, bus class data and destination data, processing transactions including ticket sales transactions and goods delivery transactions, processing income, processing costs and processing reports.

3.4. Sequence Diagram

Sequence diagrams describe the interactions between objects in and around the system (including users and forms).

1. Sequence Diagram Entrance

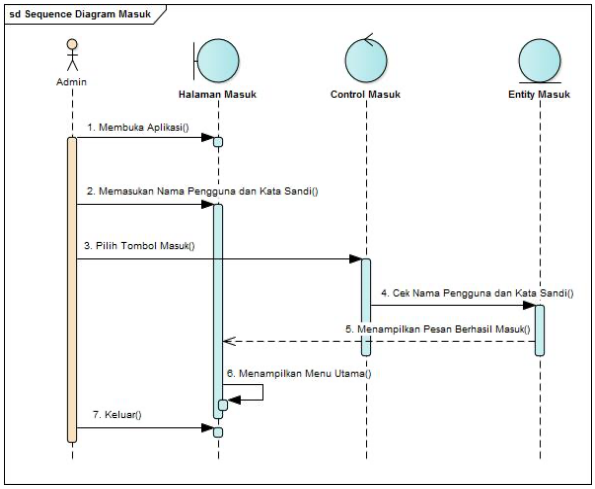

Figure 7. Sequence Diagram Entrance

In Figure 6. Login Sequence Diagram it is explained that the admin process opens the application by entering the correct username and password to go to the main menu.

2. Sequence Diagram Admin Data

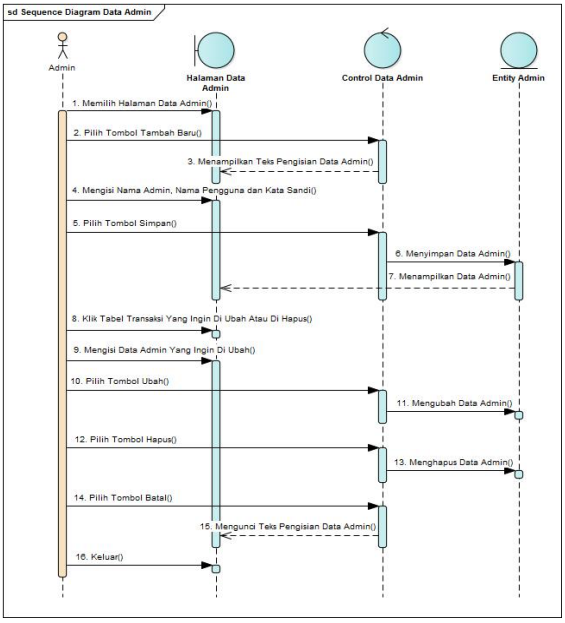

Figure 8. Sequence Diagram Admin Data

In Figure 8. Sequence Diagram of admin data, it is explained that the admin process processes admin data, starting from the process of selecting the admin data page, adding new data, filling in admin data and then saving the data which is directly stored in the database, changing and deleting existing admin data in databases.

3. Sequence Diagram Destination Data

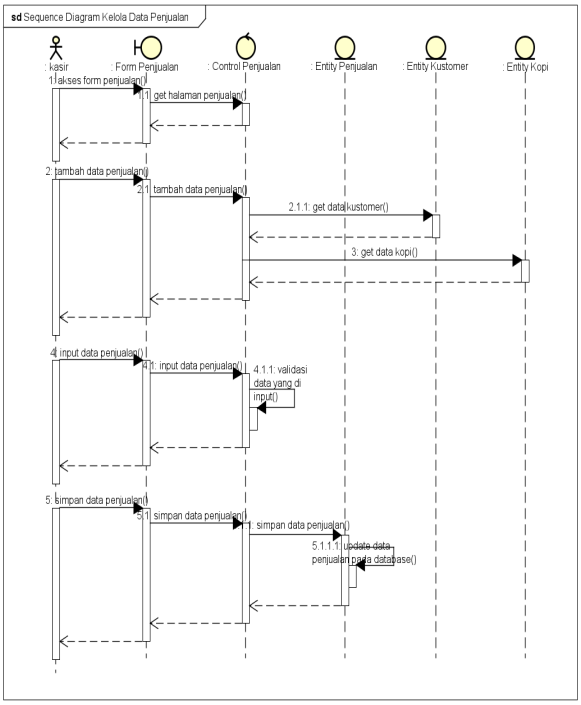

Figure 9. Sequence Diagram Destination Data

In Figure 9. Sequence Diagram of destination data, it is explained that the admin process processes the destination data, starting from the process of selecting the destination data page, adding new data, filling in the destination data and then saving the data which is directly stored in the database, changing and deleting the destination data in databases.

3.5. Deployment Diagram

The following is a deployment diagram of the income and cost processing application:

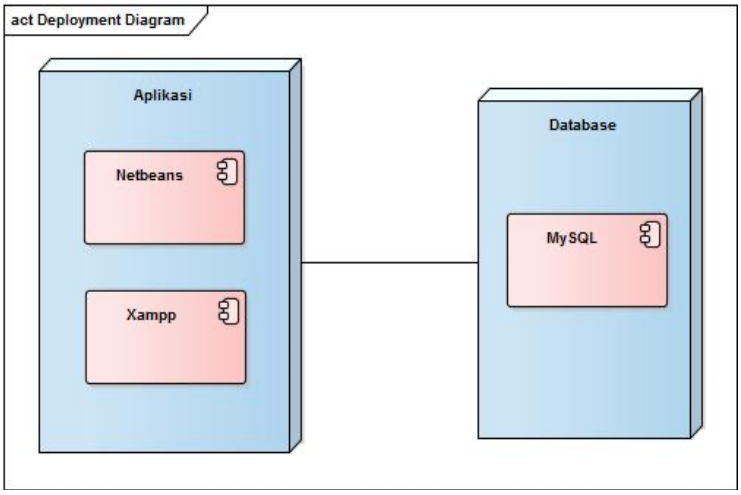

Figure 10. Class Diagrams

In Figure 10. Deployment Diagram it is explained that the software and database are used in making the program. The software that the author uses is Neatbeans and Xampp software, while for the database the author uses MySQL.

3.6 User Interface

1. Login User Interface

The login user interface is the default menu or is displayed first by the system before accessing the main page of the savings and loan processing accounting information system. Admin is required to fill in the username and password, then click the login button. Then the system will validate the username and password.

Figure 11. Login User Interface

2. Home Admin User Interface

The home user interface is a menu that appears after the admin accesses the login. This home menu contains master data, member loans, member savings and operational costs.

Figure 12. Home Admin User Interface

3. Member Data List User Interface

The user interface for the list of member data is a list managed by the admin. The display can be seen in Figure 13 as follows.

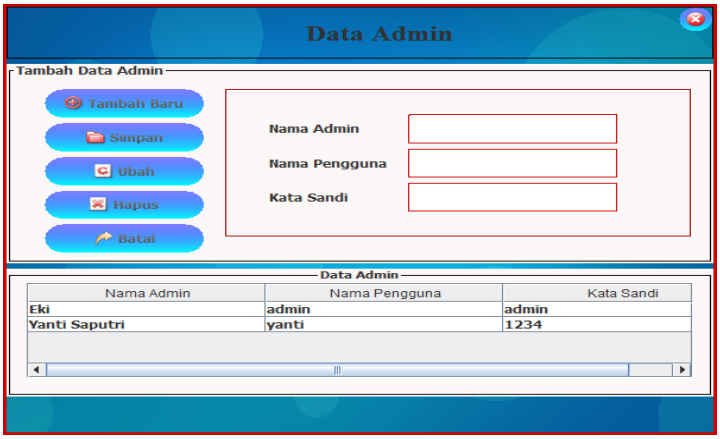

Figure 13. Member Data List User Interface

4. User Interface Transaction Fees

This page is used to make transactions. The display can be seen in Figure 14 as follows.

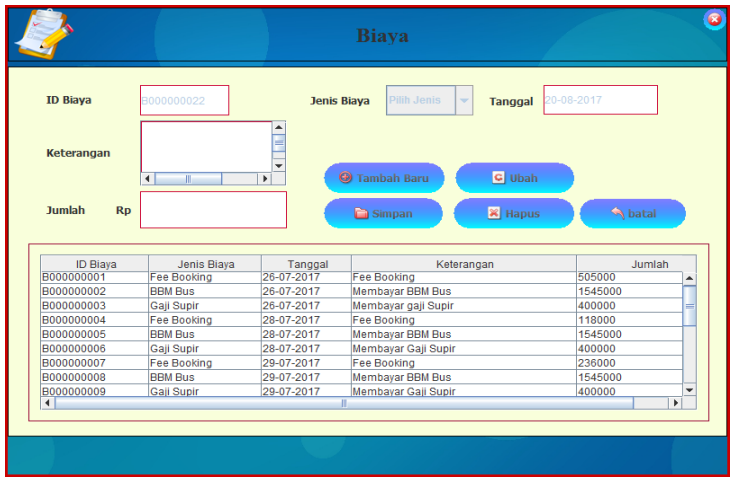

Figure 14. User Interface Transaction Fees

5. User Interface Cost Report

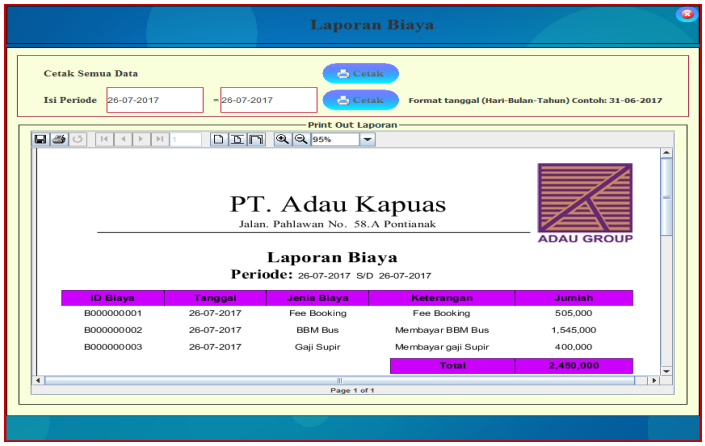

Figure 15. *User Interface Cost Report*

4. CONCLUSION

From the results of the research that has been carried out, the author can draw conclusions about several benefits of using application programs, including:

1. This income and cost processing application is designed to make it easier for companies to improve performance effectively and efficiently, making it easier to record income, store data, and create reports.
2. The income and cost processing application processes admin data, item type data, income type data, cost type data, bus class data, destination data, ticket sales transactions, goods delivery, income transactions and cost transactions.
3. The output reports produced in making income and cost processing applications are ticket sales reports, goods delivery reports, income reports and cost reports.

ACKNOWLEDGEMENTS

The author thanks Limited Liability Company Adau Kapuas that has supported and helped the implementation of research and or article writing.

REFERENCES

[1] L. Song, L. Yu, and S. Li, "Route optimization of hazardous freight transportation in a rail-truck transportation network considering road traffic restriction," *J. Clean. Prod.*, vol. 423, no. May, p. 138640, 2023, doi: 10.1016/j.jclepro.2023.138640.

[2] S. Zheng and C. Jiang, "Real options in transportation research: A review," *Transp. Econ. Manag.*, vol. 1, no. April, pp. 22–31, 2023, doi: 10.1016/j.team.2023.06.001.

[3] O. V. Voronkova, ; Anna, A. Kurochkina, I. P. Firova, ; Tatiana, and V. Bikezina, "Implementation of an information management system for industrial enterprise resource planning Implantación de un sistema de gestión de información para la planificación de recursos empresariales industriales," vol. 38, no. 49, p. 23, 2017.

[4] E. Palkina, "Transformation of business models of logistics and transportation companies in digital economy," *Transp. Res. Procedia*, vol. 63, pp. 2130–2137, 2022, doi: 10.1016/j.trpro.2022.06.239.

[5] J. Leker, C. Gelhard, and S. Von Delft, "7.1 Business Model Design: Essential Management Decisions," University of Glasgow, Adam Smith Business School, 2018.

[6] M. T. Amron, S. Abu Hassan, M. S. Saleh Hudin, and N. Janom, "Inventory Control System Using Waterfall Development Model," *Int. J. Eng. Technol.*, vol. 7, pp. 138–141, 2018, [Online]. Available: www.sciencepubco.com/index.php/IJET

[7] N. D. Arizona, Yulia, and R. Adwiya, "The Implementation of Waterfall Method in the Development of Accounting Information Systems for Web-Based Savings and Loans Data Processing (Case study :

Sompak Awe Jaya Cooperative)," *Bull. Comput. Sci. Electr. Eng.*, vol. 3, no. 2, pp. 86–96, 2022, doi: 10.25008/bcsee.v3i2.1167.

[8] R. Adwiya, N. D. Arizona, M. R. Pambudi, U. Bina, and S. Informatika, "Sales And Purchase Of Website Based Heavy Equipment Sparepart," *J. Teknol. dan Manaj. Inform.*, vol. 5, no. 1, 2019.

[9] M. S. Palmquist, M. A. Lapham, S. Miller, T. Chick, and I. Ozkaya, "Parallel Worlds: Agile and Waterfall Differences and Similarities," *SEI, Carnegie Mellon Univ.*, no. October, pp. 1–101, 2013.

[10] J. Sadiah, I. Indaryono, and A. M. Yusuf, "Sistem Informasi Akuntansi Penggajian Berbasis Vb.Net Pada PT. Bank Perkreditan Rajyat (BPR)Sanggabuana Agung Karawang," *J. Interkom J. Publ. Ilm. Bid. Teknol. Inf. dan Komun.*, vol. 15, no. 4, pp. 37–47, 2021, doi: 10.35969/interkom.v15i4.80.

[11] P. A. Ratnasari, A. Rosyidi, and Sukron, "Penerapan sistem akuntansi koperasi simpan pinjam," *J. JOINS Udinus*, vol. 1, no. 2, pp. 67–71, 2018.

[12] A. Pandya, V. S. Mani, and A. Pattanayak, "Expanding the responsibility of an offshore team and sustainably increasing business value using SAFe," *Proc. - 2020 ACM/IEEE 15th Int. Conf. Glob. Softw. Eng. ICGSE 2020*, pp. 1–5, 2020, doi: 10.1145/3372787.3390441.

[13] O. Sarwengga, J. Abdillah, and I. Yuniar, "Simpan Pinjam Berbasis Web (Studi Kasus Pada Koperasi Bina Sejahtera Bandung)," *Rekayasa Sist. Ind.*, vol. 1, no. 2, pp. 28–33, 2014.

[14] A. Alshamrani and A. Bahattab, "A Comparison Between Three SDLC Models Waterfall Model, Spiral Model, and Incremental/Iterative Model," *IJCSI Int. J. Comput. Sci. Issues*, vol. 12, no. 1, pp. 106–111, 2015, [Online]. Available: https://www.academia.edu/10793943/A_Comparison_Between_Three_SDLC_Models_Waterfall_Model_Spiral_Model_and_Incremental_Iterative_Model

[15] Ritzkal, P. P. Amalia, A. H. Hendrawan, F. Riana, and Kodarsyah, "Application Of The Waterfall Method In The Final Project Guidance Realization Information System," *J. Mantik*, vol. 6, no. 2, pp. 1449–1458, 2022.

[16] E. Pawan, R. H. . Thamrin, P. Hasan, S. H. Y. Bei, and P. Matu, "Using Waterfall Method to Design Information System of SPMI STIMIK Sepuluh Nopember Jayapura," *Int. J. Comput. Inf. Syst.*, vol. 2, no. 2, pp. 33–38, 2021, doi: 10.29040/ijcis.v2i2.29.

[17] H. J. Christanto and Y. A. Singgalen, "Analysis and Design of Student Guidance Information System through Software Development Life Cycle (SDLC) dan Waterfall Model," *J. Inf. Syst. Informatics*, vol. 5, no. 1, pp. 259–270, 2023, doi: 10.51519/journalisi.v5i1.443.

[18] F. Heriyanti and A. Ishak, "Design of logistics information system in the finished product warehouse with the waterfall method: Review literature," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 801, no. 1, 2020, doi: 10.1088/1757-899X/801/1/012100.

[19] R. Mokhtar and M. Khayyat, "A Comparative Case Study of Waterfall and Agile Management," *SAR J. - Sci. Res.*, vol. 5, no. 1, pp. 52–62, 2022, doi: 10.18421/sar51-07.

[20] Y. Bassil, "A Simulation Model for the Spiral Software Development Life Cycle," *Int. J. Enggineering Technol.*, vol. 02, no. 05, pp. 2049–3444, 2012, doi: 10.15680/ijircce.2015.0305013.

[21] S. M. Golodetz, C. Nicholls, I. D. Voiculescu, and S. A. Cameron, "Two tree-based methods for the waterfall," *Pattern Recognit.*, vol. 47, no. 10, pp. 3276–3292, 2014, doi: 10.1016/j.patcog.2014.04.017.

[22] S. Robinson, "Modes of simulation practice: Approaches to business and military simulation," *Simul. Model. Pract. Theory*, vol. 10, no. 8, pp. 513–523, 2002, doi: 10.1016/S1569-190X(02)00117-X.

[23] T. Cahyono, S. Setianingsih, and D. Iskandar, "Implementation of The Waterfall Method In The Design of A Website-Based Book Lending System," *J. Tek. Inform.*, vol. 3, no. 3, pp. 723–730, 2022, [Online]. Available: https://doi.org/10.20884/1.jutif.2022.3.3.285

[24] M. S. Rumetna, T. N. Lina, I. S. Rajagukguk, F. S. Pormes, and A. B. Santoso, "Payroll Information System Design Using Waterfall Method," *Int. J. Adv. Data Inf. Syst.*, vol. 3, no. 1, pp. 1–10, 2022, doi: 10.25008/ijadis.v3i1.1227.

[25] B. Hobbs and Y. Petit, "Agile Methods on Large Projects in Large Organizations," *Proj. Manag. J.*, vol. 48, no. 3, pp. 3–19, 2017, doi: 10.1177/875697281704800301.