DIGITALIZATION OF A REAL-TIME BUSINESS INTELLIGENCE (BI) DASHBOARD BASED ON THE LOYVERSE POS API FOR OPTIMIZING THE FINANCIAL AUDIT SYSTEM OF TRAKTIR KOPI MSME

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Abstract: This community service activity aimed to improve the financial and operational governance of MSME Traktir Kopi through the digitalization of a real-time Business Intelligence (BI) dashboard based on Loyverse POS API integration. The partner still faced problems with manual recording, time-consuming cash reconciliation, human error risks, and lack of data visualization for decision making. The method used was a participatory approach including needs analysis, development of the T-KODE application using Python, Gradio, and Plotly, socialization, installation, hands-on training, and technical mentoring. The results show that the partner is now able to automatically retrieve transaction data, perform real-time cash reconciliation audits, visualize product contributions and peak hours, and export standardized audit reports. This program contributes to increased efficiency of financial audits, transparency, and data-driven decision-making capabilities in Food and Beverage sector MSMEs.

Keywords: Traktir Kopi; Business Intelligence; Loyverse POS; API integration; Digital Financial Audit

1. Introduction

Regencies and cities in Indonesia have shown economic growth that is strongly influenced by the Micro, Small, and Medium Enterprises (MSME) sector, particularly in the Food and Beverage (F&B) industry. MSMEs in this sector serve as a primary source of income while also absorbing a significant number of workers. However, business sustainability is often disrupted by financial management practices that remain simple and have not yet been properly digitalized (Turban et al., 2011; Davis, 1989).

At the partner business, Traktir Kopi, although the Loyverse Point of Sale (POS) system has been adopted, the transaction data generated by the system remains passive. Financial audit processes, cash and non-cash reconciliation, and monitoring of risky transactions, such as refunds and discounts, are still conducted manually using Excel. This condition causes a long time lag, a high risk of human error, and difficulty in detecting revenue leakage (Pratama & Hendini, 2020). In addition, the partner faces difficulties in visualizing the contribution of best-selling products and customer peak-hour patterns, causing decision-making to remain largely subjective.

These problems further emphasize the importance of strengthening digital literacy and implementing appropriate Business Intelligence (BI). Various studies indicate that the integration of POS system APIs with BI dashboards can improve operational efficiency, audit accuracy, and MSME resilience in the digital era (McKinney, 2022; Few, 2013). Based on these conditions, this community service activity was designed to implement a real-time BI dashboard based on the Loyverse POS API named T-KODE, or Traktir Kopi Operational Dashboard Engine. The main objective is to assist the partner in developing more orderly, transparent, accurate, and data-driven administrative and financial audit practices as part of MSME digital transformation.

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2. Method

The community service activity was conducted at Traktir Kopi MSME, Srengseng Sawah, Jagakarsa, South Jakarta, on Thursday, May 7, 2026, from 10.00 to 13.00 WIB. The activity was implemented by the community service team from the Faculty of Engineering and Computer Science, Universitas Siber Indonesia, in coordination with the owner and staff of Traktir Kopi. The participants consisted of 15 people, including the business owner and operational staff.

The activity stages began with problem identification through direct observation and in-depth discussions regarding the partner's business processes. The next stage involved the development of the T-KODE application using the Python programming language, integrated with the Loyverse API and supported by the Gradio library for the interface and Plotly for interactive visualization. This was followed by socialization, system installation, hands-on training, and technical assistance.

The evaluation instruments included process observation, interactive discussion, and assessment of participants' abilities before and after the training. The assessment was carried out based on indicators of the ability to retrieve data automatically, perform cash reconciliation, understand dashboard visualization, and export audit reports.

Table 1. Activity Stages and Achievement Indicators

Stage	Main Activity	Output	Success Indicator
Identification	Direct observation and in-depth discussion with the partner	Mapping of the partner's problems and needs	The main problems are clearly identified
Development	Development of the Python-based T-KODE application with Loyverse API integration	Real-time BI dashboard application	The system is successfully integrated and functions properly
Socialization and Training	Explanation of features and hands-on training	Basic understanding and skills	Participants actively ask questions and are able to operate the dashboard
Practice	Practice in using the dashboard, including reconciliation, visualization, and report export	Audit report and data analysis	Participants are able to prepare reports independently
Mentoring	Technical guidance and post-training consultation	Independence in using the system	Operational errors are reduced, and the partner is able to use the system independently

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Table 1 presents the stages of the community service activity, which were implemented systematically from problem identification to mentoring. Each stage was clearly designed with measurable outputs and success indicators, enabling the implementation process to be more structured and directed.

Table 2. Changes in the Partner's Abilities Before and After the Training

Indicator	Before Training (Pre-Test)	After Training (Post-Test)
Understanding of Business Intelligence Concepts	Very low / Unfamiliar	Good, able to understand and apply BI concepts to the reconciliation reports of Traktir Kopi Jagakarsa
Knowledge of the Loyverse API and Data Retrieval	Very low / Unfamiliar	Able to retrieve data automatically
Ease of Manual Data Recapitulation	Manual and time-consuming	Real-time and automated
Ability to Perform Cash Reconciliation (Cash and Non-Cash)	Manual and time-consuming	Automatically detected with accuracy
Ability to Audit Risky Transactions (Refunds and Sales)	Manual and time-consuming	Real-time and automated
Ability to Prepare Financial Audit Reports	Prone to human error, manually processed using Excel	Standardized and accurate report export
Ability to Make Data-Driven Decisions	Based on subjective estimates	Based on real-time data

Table 2 presents the results of the pre-test and post-test evaluations, which describe the improvement in participants' abilities after participating in the training and mentoring on the use of the T-KODE application. The most prominent improvements were observed in the technical aspects of system operation and the ability to analyze business data in real time.

3. Results and Discussion

The implementation of the activity showed that, prior to the training, most administrative and financial audit processes were still carried out manually, making them vulnerable to errors and inefficiencies. After the implementation of T-KODE, participants were able to retrieve transaction data automatically through the API, perform real-time reconciliation of cash and non-cash transactions, and utilize dashboard visualizations to analyze product contribution through a treemap, customer peak-hour patterns, and comparisons between gross and net revenue.

Participants were also able to automatically detect risky transactions, such as refunds and discounts, and generate standardized audit reports in Excel format. This change indicates an increased awareness of the importance of data-driven decision-making. The main challenge encountered was the variation in participants' levels of digital literacy; therefore,

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intensive mentoring became a key factor in the success of the activity. This finding is in line with previous studies stating that API-based BI dashboard digitalization can strengthen financial governance and MSME competitiveness (Abdillah et al., 2024; Demu, 2023).

Figure 1. Group Photo with Participants and the Owner of Traktir Kopi Jagakarsa

Figure 2. Presentation of PKM Materials

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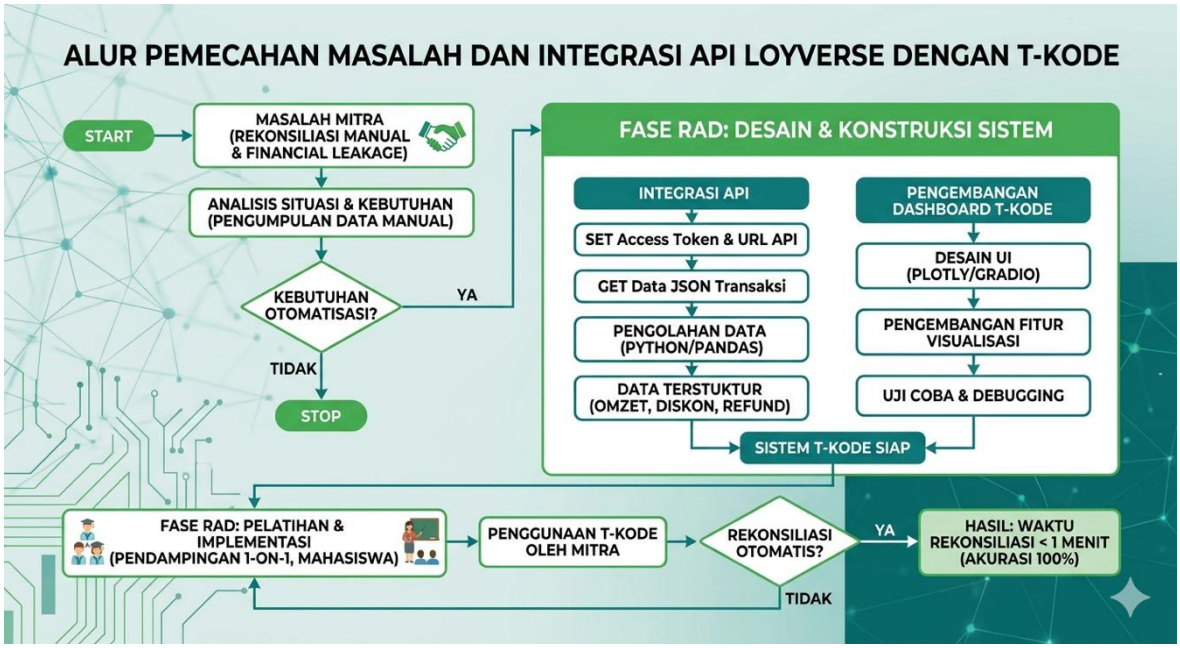

Figure 3. Problem-Solving Flow and Loyverse API Integration with the T-KODE System

The diagram above illustrates the API integration architecture and workflow of the T-KODE system that has been discussed. The following is a logical explanation of the flow:

1. Source Entity (Loyverse POS): The flow begins with transactions carried out by staff at the Traktir Kopi outlet. Each transaction is recorded in real time in the Loyverse cloud database.
2. API Integration (Data Fetching): The middleware developed using Python, namely the T-KODE Engine, sends data requests through the Application Programming Interface (API) to the Loyverse server using a security token.
3. Data Extraction (JSON Response): The server provides a response in the form of raw data in JSON format. This data contains transaction metadata, including time, items, discounts, taxes, and refund status.
4. Processing and Reconciliation (Python Engine): Within T-KODE, the data are processed using the Pandas library. The process includes:
   - Data Cleaning: Removing irrelevant data.
   - Reconciliation Logic: Automatically mapping total sales to payment methods, such as QRIS and cash, while detecting refund anomalies.
5. Business Intelligence Visualization (Dashboard): The processed data are presented in interactive graphs through the Gradio/Plotly framework. The dashboard displays critical metrics such as gross versus net sales, daily sales trends, and the contribution of best-selling products.
6. Training and Implementation: This is a crucial stage in which the completed system is handed over to the partner. The lecturer team, together with students through the MBKM scheme, provides intensive technical training to 15 participants, consisting of the owner and cashier staff. Students play an important role in providing one-on-one assistance, helping with installation on the partner's devices, and simulating the reconciliation process using real data.

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7. Use by the Partner and Strategic Output: After the training, the owner is able to receive accurate reconciliation reports within seconds. This information is used for data-driven decision-making to mitigate financial leakage.

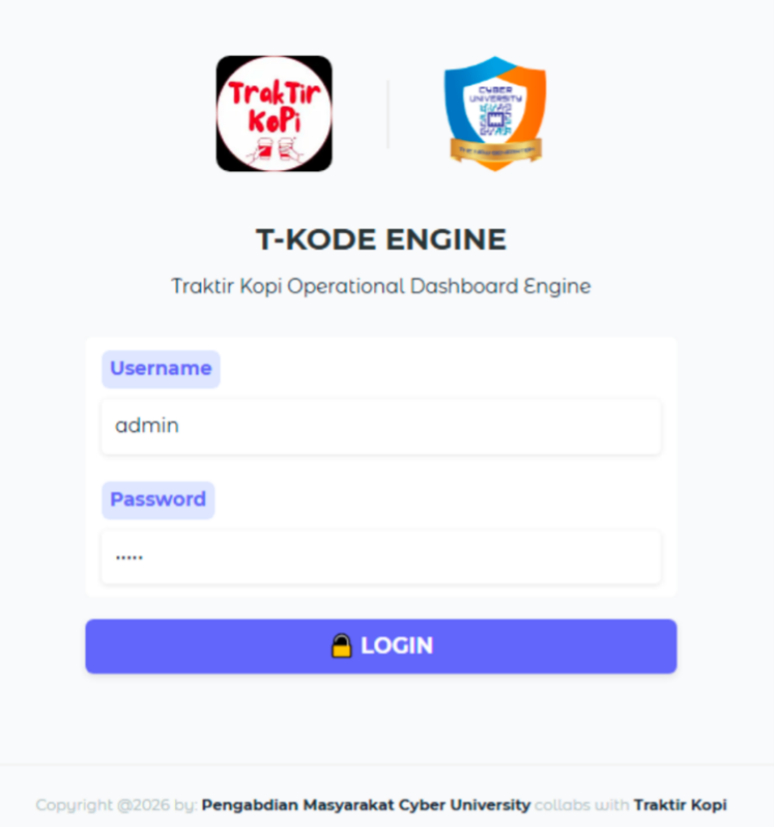

Figure 4. T-KODE System Login

Figure 5. T-KODE System BI Dashboard

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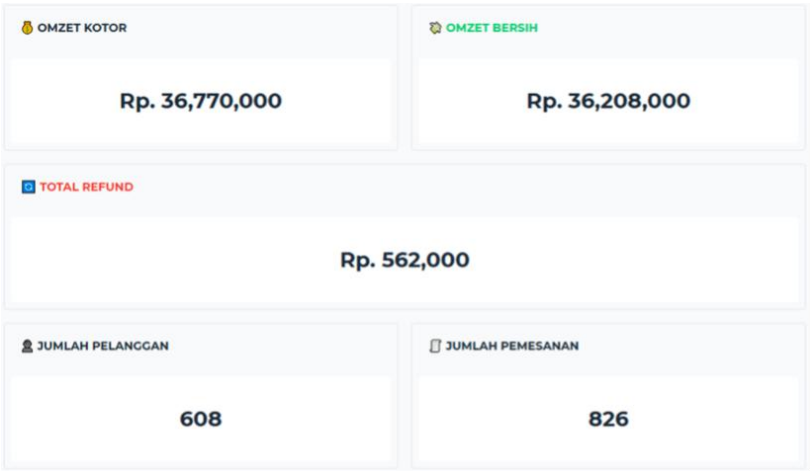
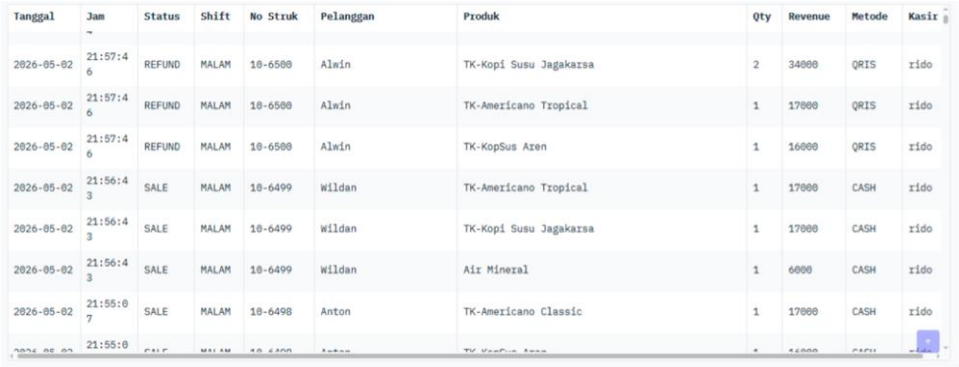
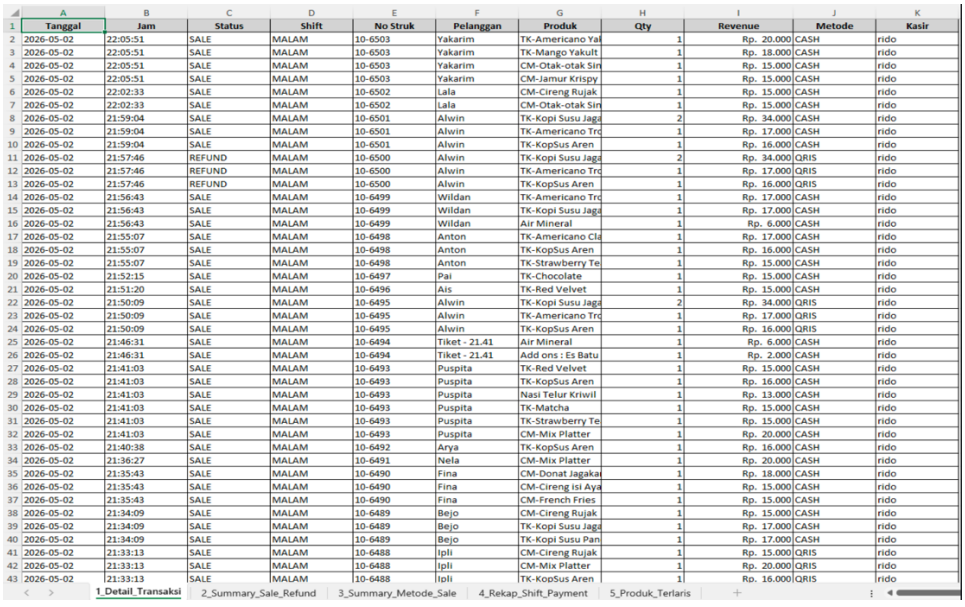


Figure 6. T-KODE System Revenue Dashboard



Tanggal	Jam	Status	Shift	No Struk	Pelanggan	Produk	Qty	Revenue	Metode	Kasir
2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-Kopi Susu Jagakarsa	2	34000	QRIS	rido
2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-Americano Tropical	1	17000	QRIS	rido
2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-KopSus Aren	1	16000	QRIS	rido
2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	TK-Americano Tropical	1	17000	CASH	rido
2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	TK-Kopi Susu Jagakarsa	1	17000	CASH	rido
2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	Air Mineral	1	6000	CASH	rido
2026-05-02	21:55:07	SALE	MALAM	10-6498	Anton	TK-Americano Classic	1	17000	CASH	rido
	21:55:0									

Figure 7. T-KODE System Transaction Detail Dashboard



	A	B	C	D	E	F	G	H	I	J	K
1	Tanggal	Jam	Status	Shift	No Struk	Pelanggan	Produk	Qty	Revenue	Metode	Kasir
2	2026-05-02	22:05:51	SALE	MALAM	10-6503	Yakarim	TK-Americano Yal	1	Rp. 20.000	CASH	rido
3	2026-05-02	22:05:51	SALE	MALAM	10-6503	Yakarim	TK-Mango Yakult	1	Rp. 18.000	CASH	rido
4	2026-05-02	22:05:51	SALE	MALAM	10-6503	Yakarim	CM-Otak-otak Sir	1	Rp. 15.000	CASH	rido
5	2026-05-02	22:05:51	SALE	MALAM	10-6503	Yakarim	CM-Jamur Krispy	1	Rp. 15.000	CASH	rido
6	2026-05-02	22:02:33	SALE	MALAM	10-6502	Lala	CM-Cireng Rujak	1	Rp. 15.000	CASH	rido
7	2026-05-02	22:02:33	SALE	MALAM	10-6502	Lala	CM-Otak-otak Sir	1	Rp. 15.000	CASH	rido
8	2026-05-02	21:59:04	SALE	MALAM	10-6501	Alwin	TK-Kopi Susu Jaga	2	Rp. 34.000	CASH	rido
9	2026-05-02	21:59:04	SALE	MALAM	10-6501	Alwin	TK-Americano Tro	1	Rp. 17.000	CASH	rido
10	2026-05-02	21:59:04	SALE	MALAM	10-6501	Alwin	TK-KopSus Aren	1	Rp. 16.000	CASH	rido
11	2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-Kopi Susu Jaga	2	Rp. 34.000	QRIS	rido
12	2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-Americano Tro	1	Rp. 17.000	QRIS	rido
13	2026-05-02	21:57:46	REFUND	MALAM	10-6500	Alwin	TK-KopSus Aren	1	Rp. 16.000	QRIS	rido
14	2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	TK-Americano Tro	1	Rp. 17.000	CASH	rido
15	2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	TK-Kopi Susu Jaga	1	Rp. 17.000	CASH	rido
16	2026-05-02	21:56:43	SALE	MALAM	10-6499	Wildan	Air Mineral	1	Rp. 6.000	CASH	rido
17	2026-05-02	21:55:07	SALE	MALAM	10-6498	Anton	TK-Americano Cla	1	Rp. 17.000	CASH	rido
18	2026-05-02	21:55:07	SALE	MALAM	10-6498	Anton	TK-KopSus Aren	1	Rp. 16.000	CASH	rido
19	2026-05-02	21:55:07	SALE	MALAM	10-6498	Anton	TK-Strawberry Te	1	Rp. 15.000	CASH	rido
20	2026-05-02	21:52:15	SALE	MALAM	10-6497	Pai	TK-Chocolate	1	Rp. 15.000	CASH	rido
21	2026-05-02	21:51:20	SALE	MALAM	10-6496	Ais	TK-Red Velvet	1	Rp. 15.000	CASH	rido
22	2026-05-02	21:50:09	SALE	MALAM	10-6495	Alwin	TK-Kopi Susu Jaga	2	Rp. 34.000	QRIS	rido
23	2026-05-02	21:50:09	SALE	MALAM	10-6495	Alwin	TK-Americano Tro	1	Rp. 17.000	QRIS	rido
24	2026-05-02	21:50:09	SALE	MALAM	10-6495	Alwin	TK-KopSus Aren	1	Rp. 16.000	QRIS	rido
25	2026-05-02	21:46:31	SALE	MALAM	10-6494	Tiket - 21.41	Air Mineral	1	Rp. 6.000	CASH	rido
26	2026-05-02	21:46:31	SALE	MALAM	10-6494	Tiket - 21.41	Add ons : Es Batu	1	Rp. 2.000	CASH	rido
27	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	TK-Red Velvet	1	Rp. 15.000	CASH	rido
28	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	TK-KopSus Aren	1	Rp. 16.000	CASH	rido
29	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	Nasi Telur Kriwil	1	Rp. 13.000	CASH	rido
30	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	TK-Matcha	1	Rp. 15.000	CASH	rido
31	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	TK-Strawberry Te	1	Rp. 15.000	CASH	rido
32	2026-05-02	21:41:03	SALE	MALAM	10-6493	Puspita	CM-Mix Platter	1	Rp. 20.000	CASH	rido
33	2026-05-02	21:40:38	SALE	MALAM	10-6492	Arya	TK-KopSus Aren	1	Rp. 16.000	CASH	rido
34	2026-05-02	21:36:27	SALE	MALAM	10-6491	Nela	CM-Mix Platter	1	Rp. 20.000	CASH	rido
35	2026-05-02	21:35:43	SALE	MALAM	10-6490	Fina	CM-Donat Jagakar	1	Rp. 18.000	CASH	rido
36	2026-05-02	21:35:43	SALE	MALAM	10-6490	Fina	CM-Cireng isi Aya	1	Rp. 15.000	CASH	rido
37	2026-05-02	21:35:43	SALE	MALAM	10-6490	Fina	CM-French Fries	1	Rp. 15.000	CASH	rido
38	2026-05-02	21:34:09	SALE	MALAM	10-6489	Bejo	CM-Cireng Rujak	1	Rp. 15.000	CASH	rido
39	2026-05-02	21:34:09	SALE	MALAM	10-6489	Bejo	TK-Kopi Susu Jaga	1	Rp. 17.000	CASH	rido
40	2026-05-02	21:34:09	SALE	MALAM	10-6489	Bejo	TK-Kopi Susu Pan	1	Rp. 17.000	CASH	rido
41	2026-05-02	21:33:13	SALE	MALAM	10-6488	Ipli	CM-Cireng Rujak	1	Rp. 15.000	QRIS	rido
42	2026-05-02	21:33:13	SALE	MALAM	10-6488	Ipli	CM-Mix Platter	1	Rp. 20.000	QRIS	rido
43	2026-05-02	21:33:13	SALE	MALAM	10-6488	Ipli	TK-KopSus Aren	1	Rp. 16.000	QRIS	rido

1_Detail_Transaksi | 2_Summary_Sale_Refund | 3_Summary_Metode_Sale | 4_Rekap_Shift_Payment | 5_Produk_Terlaris

Figure 8. Export of the T-KODE System Transaction Detail Data Reconciliation Report

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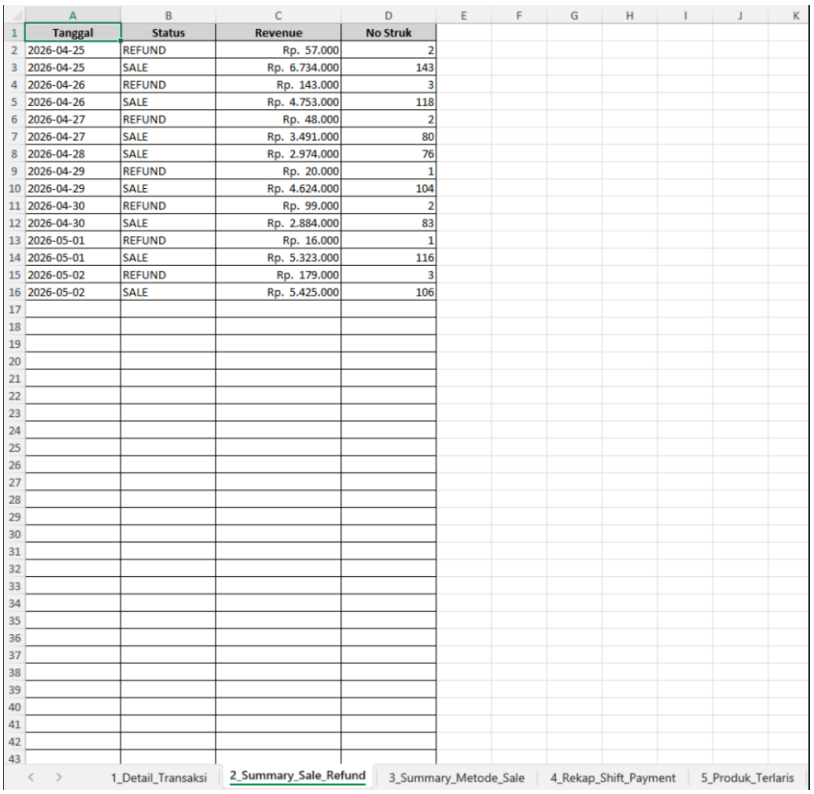
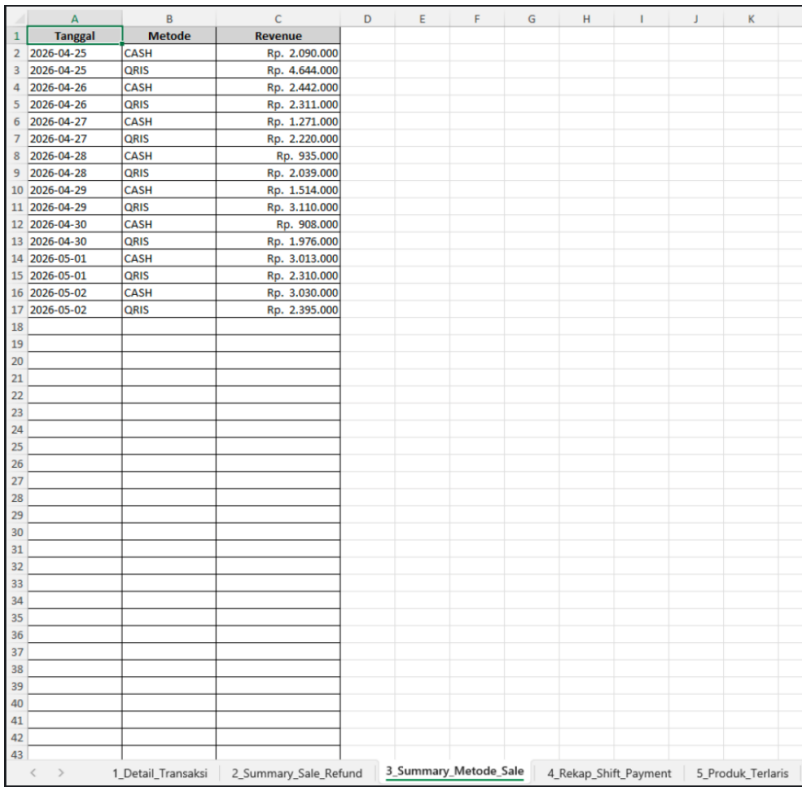


Tanggal	Status	Revenue	No Struk
2026-04-25	REFUND	Rp. 57.000	2
2026-04-25	SALE	Rp. 6.734.000	143
2026-04-26	REFUND	Rp. 143.000	3
2026-04-26	SALE	Rp. 4.753.000	118
2026-04-27	REFUND	Rp. 48.000	2
2026-04-27	SALE	Rp. 3.491.000	80
2026-04-28	SALE	Rp. 2.974.000	76
2026-04-29	REFUND	Rp. 20.000	1
2026-04-29	SALE	Rp. 4.624.000	104
2026-04-30	REFUND	Rp. 99.000	2
2026-04-30	SALE	Rp. 2.884.000	83
2026-05-01	REFUND	Rp. 16.000	1
2026-05-01	SALE	Rp. 5.323.000	116
2026-05-02	REFUND	Rp. 179.000	3
2026-05-02	SALE	Rp. 5.425.000	106

Figure 9. Export of the T-KODE System Sales Refund Summary Data Reconciliation Report



Tanggal	Metode	Revenue
2026-04-25	CASH	Rp. 2.090.000
2026-04-25	QRIS	Rp. 4.644.000
2026-04-26	CASH	Rp. 2.442.000
2026-04-26	QRIS	Rp. 2.311.000
2026-04-27	CASH	Rp. 1.271.000
2026-04-27	QRIS	Rp. 2.220.000
2026-04-28	CASH	Rp. 935.000
2026-04-28	QRIS	Rp. 2.039.000
2026-04-29	CASH	Rp. 1.514.000
2026-04-29	QRIS	Rp. 3.110.000
2026-04-30	CASH	Rp. 908.000
2026-04-30	QRIS	Rp. 1.976.000
2026-05-01	CASH	Rp. 3.013.000
2026-05-01	QRIS	Rp. 2.310.000
2026-05-02	CASH	Rp. 3.030.000
2026-05-02	QRIS	Rp. 2.395.000

Figure 10. Export of the T-KODE System Sales Refund Summary Data Reconciliation Report

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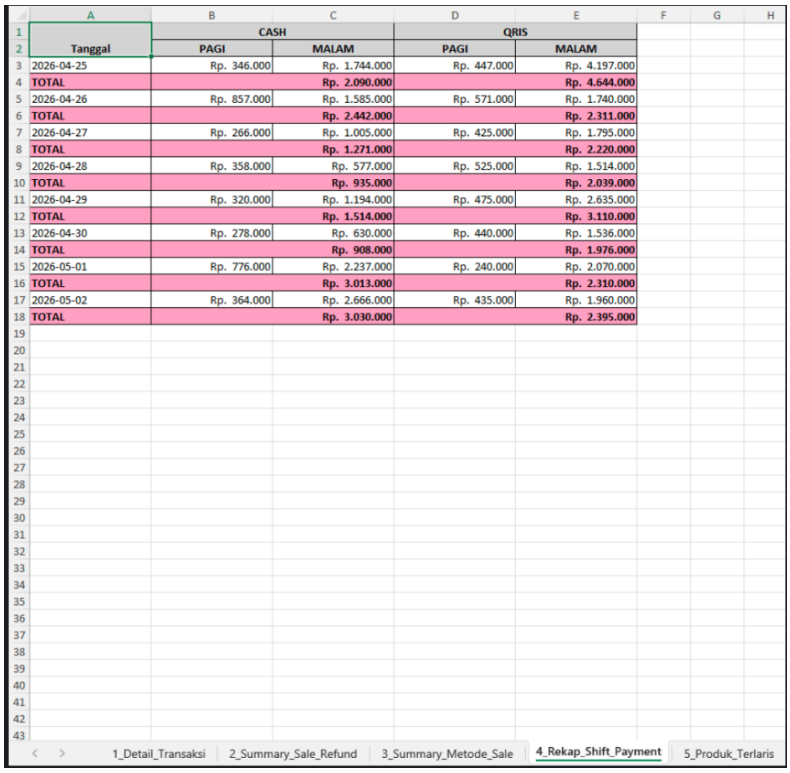
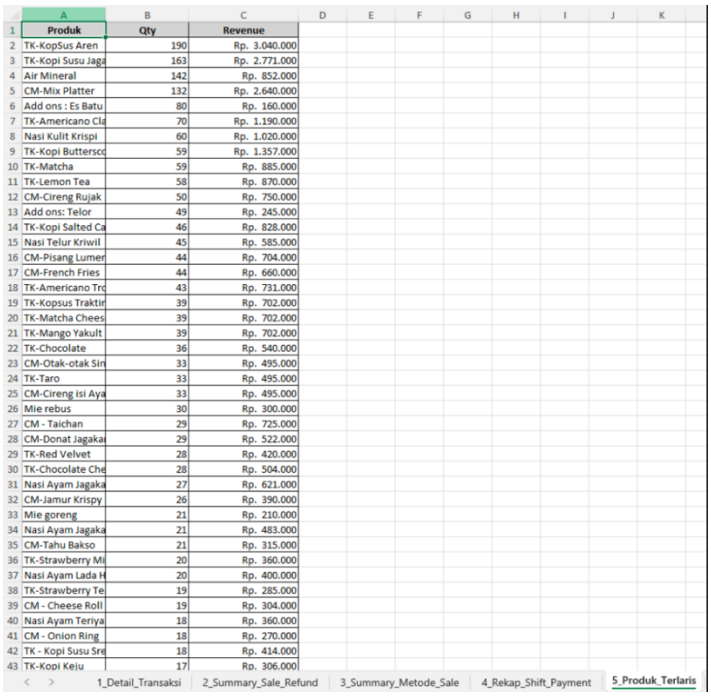


	Tanggal	CASH		QRIS	
		PAGI	MALAM	PAGI	MALAM
3	2026-04-25	Rp. 346.000	Rp. 1.744.000	Rp. 447.000	Rp. 4.197.000
4	**TOTAL**		**Rp. 2.090.000**		**Rp. 4.644.000**
5	2026-04-26	Rp. 857.000	Rp. 1.585.000	Rp. 571.000	Rp. 1.740.000
6	**TOTAL**		**Rp. 2.442.000**		**Rp. 2.311.000**
7	2026-04-27	Rp. 266.000	Rp. 1.005.000	Rp. 425.000	Rp. 1.795.000
8	**TOTAL**		**Rp. 1.271.000**		**Rp. 2.220.000**
9	2026-04-28	Rp. 358.000	Rp. 577.000	Rp. 525.000	Rp. 1.514.000
10	**TOTAL**		**Rp. 935.000**		**Rp. 2.039.000**
11	2026-04-29	Rp. 320.000	Rp. 1.194.000	Rp. 475.000	Rp. 2.635.000
12	**TOTAL**		**Rp. 1.514.000**		**Rp. 3.110.000**
13	2026-04-30	Rp. 278.000	Rp. 630.000	Rp. 440.000	Rp. 1.536.000
14	**TOTAL**		**Rp. 908.000**		**Rp. 1.976.000**
15	2026-05-01	Rp. 776.000	Rp. 2.237.000	Rp. 240.000	Rp. 2.070.000
16	**TOTAL**		**Rp. 3.013.000**		**Rp. 2.310.000**
17	2026-05-02	Rp. 364.000	Rp. 2.666.000	Rp. 435.000	Rp. 1.960.000
18	**TOTAL**		**Rp. 3.030.000**		**Rp. 2.395.000**

1_Detail_Transaksi | 2_Summary_Sale_Refund | 3_Summary_Metode_Sale | 4_Rekap_Shift_Payment | 5_Produk_Terlaris

Figure 11. Export of the T-KODE System Shift Payment Recapitulation Data Reconciliation Report



	Produk	Qty	Revenue
2	TK-KopSus Aren	190	Rp. 3.040.000
3	TK-Kopi Susu Jaga	163	Rp. 2.771.000
4	Air Mineral	142	Rp. 852.000
5	CM-Mix Platter	132	Rp. 2.640.000
6	Add ons : Es Batu	80	Rp. 160.000
7	TK-Americano Cla	70	Rp. 1.190.000
8	Nasi Kulit Krispi	60	Rp. 1.020.000
9	TK-Kopi Buttersc	59	Rp. 1.357.000
10	TK-Matcha	59	Rp. 885.000
11	TK-Lemon Tea	58	Rp. 870.000
12	CM-Cireng Rujak	50	Rp. 750.000
13	Add ons: Telor	49	Rp. 245.000
14	TK-Kopi Salted Ca	46	Rp. 828.000
15	Nasi Telur Krivil	45	Rp. 585.000
16	CM-Pisang Lumer	44	Rp. 704.000
17	CM-French Fries	44	Rp. 660.000
18	TK-Americano Tro	43	Rp. 731.000
19	TK-Kopsus Traktir	39	Rp. 702.000
20	TK-Matcha Chees	39	Rp. 702.000
21	TK-Mango Yakult	39	Rp. 702.000
22	TK-Chocolate	36	Rp. 540.000
23	CM-Otak-otak Sin	33	Rp. 495.000
24	TK-Taro	33	Rp. 495.000
25	CM-Cireng isi Aya	33	Rp. 495.000
26	Mie rebus	30	Rp. 300.000
27	CM - Taichan	29	Rp. 725.000
28	CM-Donat Jagakar	29	Rp. 522.000
29	TK-Red Velvet	28	Rp. 420.000
30	TK-Chocolate Che	28	Rp. 504.000
31	Nasi Ayam Jagaka	27	Rp. 621.000
32	CM-Jamur Krispy	26	Rp. 390.000
33	Mie goreng	21	Rp. 210.000
34	Nasi Ayam Jagaka	21	Rp. 483.000
35	CM-Tahu Bakso	21	Rp. 315.000
36	TK-Strawberry Mi	20	Rp. 360.000
37	Nasi Ayam Lada H	20	Rp. 400.000
38	TK-Strawberry Te	19	Rp. 285.000
39	CM - Cheese Roll	19	Rp. 304.000
40	Nasi Ayam Teriya	18	Rp. 360.000
41	CM - Onion Ring	18	Rp. 270.000
42	TK - Kopi Susu Sre	18	Rp. 414.000
43	TK-Kopi Keju	17	Rp. 306.000

1_Detail_Transaksi | 2_Summary_Sale_Refund | 3_Summary_Metode_Sale | 4_Rekap_Shift_Payment | 5_Produk_Terlaris

Figure 12. Export of the T-KODE System Shift Payment Recapitulation Data Reconciliation Report

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4. Conclusion

This community service activity shows that the training and implementation of a real-time Business Intelligence dashboard based on the Loyverse POS API can strengthen the administrative and financial audit capabilities of Traktir Kopi MSME. The partner is now able to perform data recording, reconciliation, and visualization automatically, accurately, and in real time.

The appropriate technology approach, combined with training and mentoring, proved effective in improving digital literacy and operational efficiency among MSMEs in the Food and Beverage sector. This program provides a tangible contribution to the digital transformation of MSMEs in urban areas facing intense competition. It is recommended that similar activities be continued by adding stock management features and tax reporting integration to support better sustainability.

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