**Safaricom Internal Audit**

Post-Implementation Review of the Customer Value Management (CVM) Analytics and Campaign Management Tool

Audit Report

Audit Ref: 07 – FY24

23 October 2023

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| **For Action:** |  | **For Information:** |
| **Morten Bangsgaard – Chief Technology Information Officer**  **Fawzia Ali-Kimanthi – Chief Consumer Business Officer** |  | **Board Audit Committee**  **Executive Committee** |

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**BACKGROUND, OBJECTIVES AND SCOPE**

1. **Background**

An effective Customer Value Management (CVM) platform was one of the key pillars for revenue growth and overall customer value management. CVM platform was a strategic approach to managing customer relationships to create, deliver, and capture value for customers by understanding the value that customers placed on different products and services, and aligning the business offerings with those values.

The previous platform which was supplied by Flytxt in May 2015 and had been operated on a revenue-share model was coming to end of life and a more modern platform incorporating new technologies such as machine learning was needed to anchor revenue growth as per the Safaricom mission. Safaricom borrowed from the extensive supply market analysis done by Vodafone and identified IBM, Flytxt and Tech Mahindra as the top vendors for provision of CVM Analytics and Campaign Management solution.

During the period of the tender, and as part of the finalized Technology Strategy, the Group (Vodacom/Safaricom) decided to make certain platforms common across the Group to build the required Centre of Excellence to power the business. CVM was one such platform due to its criticality to revenue growth, and it was decided to standardize on the Unica platform provided by IBM which was being used by the Vodacom Group. Safaricom signed the following contracts for the CVM solution:

* With IBM East Africa on 01 May 2021 for implementation of the CVM tool based on Unica platform, provision of technical platform support and operations support for a period of five years at a cost of USD 4,350,000.00.
* With HCL Technologies on 02 June 2021 for provision of licenses for their Unica Platform at a total cost of USD 1,593,430.00 for a period of five years.
* With Ecosystem NXT PTY LTD on 01 November 2021 for provision of a global real-time recommender engine solution at a cost of USD 420,905.00 for a period of three years.

The UNICA platform was managed by Kamau Maina, HOD – Big Data and CVM Tech Delivery Lead and the CVM business operations was managed by Gideon Mumo, Tribe Lead Base Growth Tribe. The Global Recommender solution was managed by Charlotte Kepadisa, HOD - Big Data and Business Analytics.

Since UNICA system was a new platform that was introduced on the Safaricom network, the audit was carried out to assess the following:

* To determine whether the project objectives were met.
* Identify any problems or issues with the systems.
* Assess the overall value of the project.
* Identify any risks or challenges that may arise in future.

1. **Overall objectives**

Internal audit provides independent assurance on the effectiveness of governance, risk management and internal controls. The objective of the audit engagement was to:

* Identify and report on significant control, risk management and governance weaknesses as per audit scope.
* Provide early warning to management of potential control weaknesses.
* Identify and promote good business practices.

1. **Approach**

In addressing the scope, the audit was conducted in conformance with the International Professional Practices Framework (IPPF) issued by the Institute of Internal Auditors. The audit was based on inquiry, observation, analytical review procedures and limited testing of transactions.

1. **Scope**

To achieve the engagement objectives, the review covered the scope below:

* Functional requirements and business objectives of the implementation
* Application controls, user access management and logical access controls
* Adequacy of system functionality, performance, and reports to support business processes.
* System integrations, data processing and storage Integrity
* IT general controls including incident, change management, system resilience.
* Contracting, project management, documentation, and post-go-live support

1. **Audit period**

The review scope covered the period from April 2022 to September 2023

1. **Audit team**

* Bryan Mwai- Senior Manager, responsible for the Audit
* Pamela Nyakoah
* Hilary Owegi
* Martin Mangoli

1. **Field work period**

14 August 2023 to 13 October 2023

**TERMINOLOGIES**

|  |  |
| --- | --- |
| **BI** | Business Intelligence - Safaricom Data warehouse which was being used as a data source. |
| **BIRT** | Business Intelligence Reporting Tool – A visualization reporting tool used to report on campaign performance and revenue conversions. |
| **CA** | Certificate Authority – is a Trusted entity that issues digital certificates to verify identities online. |
| **CIS** | Center for Internet Security – a nonprofit organization harnessing the power of global IT community to safeguard public and private organizations against cyber threats. |
| **CACM** | Continuous Auditing and Continuous Monitoring – A list of automated tasks that execute audit tests on a certain frequency. |
| **CBS** | Convergent Billing System – a centralized system used by Safaricom to bill customers |
| **CG** | Control Group – A specific segment of customers exhibiting certain characteristics that are not subjected to treatment of machine learning models, and used to compare with performance of customers that were served by machine learning models. |
| **CSV** | Comma Separated Values – is a plain text file format that stores tabular data in rows and columns, separated by commas. |
| **CVM** | Customer Value Management – a holistic approach of evaluating what drives value for individual subscribers in their journey and experience throughout their lifecycle. |
| **DBA** | Database Administrator – a role within a database that has very high privileges to execute sensitive queries on the database. |
| **ETL** | Extract Transform Load jobs – automated computer tasks that fetch data from one system and saves into another storage location. |
| **FTTH** | Fiber To The Home - is a super-fast internet connection that uses fiber optic cables to deliver data directly to customer homes. |
| **GR** | Global Recommender – A machine learning tool used to give real time offers to customers. |
| **IBM** | International Business Machines – Company awarded tender to provide the CVM solution. |
| **KPI** | Key Performance Indicator – a quantifiable measure of progress towards a specific goal.  **CBS** (Provisioning) |
| **KYC** | Know Your Customer – A combination of information that businesses use to verify the identity of their customers. |
| **RHEL** | Red Hat Enterprise Linux – an operating system technology where applications and databases are installed |
| **RFP** | Request for Proposal - A formal invitation to vendors to submit proposals for a specific project or service |
| **SMS** | Short Message Service – A channel of communication Safaricom uses to send targeted outbound campaign offers to customers. |
| **SSL** | Secure Socket Layer – a technology used to encrypt data transmitted between systems, keeping it safe from eavesdropping and tampering. |
| **SUBREG** | Subscriber Registration system – a tool used to register subscribers on the Safaricom network. |
| **TG** | Target Group – A specific segment of customers exhibiting certain characteristics the company gives offers by using machine learning models. |
| **TNS** | Transparent Network Substrate – is a proprietary Oracle networking technology that simplifies connecting to Oracle databases |
| **USD** | United States Dollars – Currency used in the contractual payments. |
| **USSD** | Unstructured Supplementary Service Data – A channel of communication customers use on their devices to get inbound offers. |
| **VAT** | Value Added Tax – is a consumption tax on goods and services that is levied on companies when making payments. |

**AUDIT OPINION**

**Opinion and grading**

Based on our review, the audit grading for the Customer Value Management system UNICA Post Implementation Review is **Needs Improvement,** contributing **50%** to your divisional Internal Audit Score (IAS). The system of internal controls is **not adequate or effective** to provide assurance that the process/program objectives are met; **significant control weaknesses** have been identified which require **urgent remediation.**

**Basis of opinion**

We observed good practices in the contract negotiation process in which the team managed to secure a license-based contract model with the vendor unlike the previous arrangement with NEON FlyTxt which was based on revenue share. The team also managed to decommission the FlyTxt solution three months before end of their contract. In addition the business relied on Machine Learning models to serve a base of 5.7M customers with personalized data offers.

Specific areas of improvement noted during the audit include:

* The need for an automated CVM tool for campaign management and execution highlighted in the contractual requirements was not realized. The UNICA platform did not rely on the Data Mart which had been implemented as a source of data to execute automated outbound and inbound campaigns. Instead, the data was extracted manually from BI data warehouse and uploaded in the UNICA system on periodic basis to run the campaigns.
* Safaricom paid USD 130,800 to IBM East Africa for machine learning models that were not implemented as outlined in the signed contract. The Global recommender system was relied on to give real time data offers to customers. However, the platform only covered 5.7M customers with data offers and had not been extended to the entire base of subscribers and it did not cover voice, SMS, M-PESA and FTTH services.
* The CVM solutions implemented did not meet key areas of interest and non-negotiable requirements tabled in the RFP document. Safaricom intended to have a solution to manage real-time contextual push marketing campaigns for Voice, Data and M-PESA for both inbound and outbound campaigns but voice and retail CVM campaigns had not been implemented.
* The UNICA system lacked a reporting module that could be used to track revenues and conversion rates for outbound campaigns making it difficult to ascertain whether the campaigns were working as intended. For inbound campaigns the system sent email notifications outlining the revenues and conversions per campaign on an hourly basis.
* The UNICA system was running on operating systems and databases with open high risk cybersecurity issues, posing cyber-risks to the CVM ecosystem and the greater Safaricom environment. The operating systems on two Middleware servers had four high risk vulnerabilities that remained open for 99 days before they were closed while the UNICA databases had seven high risk issues that had not been resolved for over one year.
* As at the time of the review, there was no inhouse Safaricom staff member who had knowledge and skills to develop and execute CVM campaigns. The business relied entirely on the vendor in as much as there was a two-week training carried out after project implementation for Safaricom staff and covered campaign management and execution. In addition, there was no plan documented for skills transfer as part of the handover process to avoid overreliance on the vendor.

**RISK DISTRIBUTION, ROOT CAUSE ANALYSIS AND REPORT GRADING**

Summary risk ratings of identified observations are distributed as follows:

**Report grading criteria.**

|  |  |
| --- | --- |
| **Grading** | **Description** |
| **(A) Good (95%)** | No significant material findings. The risk management, internal controls and governance processes are **adequate and effective**. The system of internal controls is **robust** to provide sufficient assurance over process design and operating effectiveness of internal controls to mitigate and/or manage inherent risks. The audit will be rated as ‘Good’ when all of the following conditions are met:   * There are no audit findings reported or only low risk control deficiencies were identified. * There are no thematic repeat audit findings identified. |
| **(B+) Satisfactory (75%)** | The system of internal controls is **largely adequate and effective** to provide assurance that the process /program objectives are met. Identified control weaknesses require remediation. The audit will be rated as ‘Satisfactory’ when all of the following conditions (where applicable) are met:   * No high risk finding. * Only medium and low risk findings. * No repeat audit findings * Identified control weaknesses require remediation. |
| **(B-) Needs Improvement (50%)** | The system of internal controls is **not adequate or effective** to provide assurance that the process/program objectives are met; **significant control weaknesses** have been identified which require **urgent remediation**. The report will be rated as a ‘Needs Improvement’ when one or more or the following conditions are met:   * One or more repeat medium risk audit issues. * A fraud risk exposure classified as moderate. * Regulatory/litigation exposure classified as moderate. * Cyber security risk exposure classified as medium on CVSS. |
| **(C) Unsatisfactory (30%)** | Not fit for purpose. The system of governance, risk management and internal controls is **fundamentally inadequate** and/or ineffective to provide assurance that the **process/program objectives are met**; several/major control weaknesses have been identified which require **immediate remediation**. The audit will be rated as ‘Unsatisfactory’ when one or more of the following conditions are met:   * One or more high risk control gaps/findings/ repeat high risk audit issues. * The number and severity of issues relative to the size and scope of the operation being audited indicate pervasive, systemic, or individually serious weaknesses. * A fraud risk exposure classified as high where integrity concerns have been noted. * Regulatory/litigation exposure classified as high which could result in significant penalties and sanctions. * Cyber security exposures identified are classified as high or critical on the CVSS (i.e., technical impact) and have publicly available exploits relating to the vulnerabilities (i.e., threat exists). |

# **EXECUTIVE SUMMARY - Information Flow for Outbound Campaigns**

**Outbound Process Flow**

1. By design and best practice, the CVM DataMart gets customer KPIs data from BI data warehouse to build customer segmentation data.
   1. The team manually uploaded customer KPIs to the UNICA platform to execute the campaigns.
2. UNICA Campaign module connects to the Data Mart or Staging Servers to extract customer segments required for batch (outbound) campaigns and assign offers.
3. Unica Link module picks the data and sends a request to the outbound channels (SMS)
4. The channels display the offers to the customer and sends a delivery report to the UNICA Response History tables.
5. The customer makes the purchase through inbound channels (USSD or App)
6. The request is sent to Convergent Billing System (CBS) for billing and provisioning.
7. CBS sends this transaction to BI for reporting.
8. The UNICA system sends an email notification to the business on hourly basis for the campaigns that ran and their delivery reports.

7

6

CBS (Provisioning)

(Provisioning)

1

8

**Gaps noted.**

* The data extraction jobs required to update the customer segmentation data in the Data Mart were not running as scheduled.
* Inaccurate and incomplete data stored within the Data Mart was relied on to execute the campaigns.
* Due to the failures of the data extraction jobs, the team manually uploaded data to the UNICA system via staging servers to run the campaigns.
* The UNICA system only sent delivery reports for the campaigns that were executed. Reporting on revenues from the outbound campaigns was not implemented as per the contractual agreements.

a)

5

USSD (Channel)

**Customer**

**BI** (Data Warehouse)

2

**Staging Servers** (Customer Segmentation)

a)

**DataMart** (Customer Segmentation)

8

**Emails**

(Delivery Reports)

4

**Response History** (Deliveries)

**UNICA Campaign Module** (Offers)

**SMS** (Channel)

4

2

3

1

# **EXECUTIVE SUMMARY - Information Flow for Inbound Campaigns**

**BI** (Data Warehouse)

**Inbound Process Flow**

1. CVM data mart gets customer KPIs data from BI data warehouse to build customer profile.
2. UNICA Interact module connects to the Data Mart to extract customer profile required for real-time (inbound) campaigns and assign offers.
3. The customer dials \*444# USSD code.
4. The channels display the offers to the customer based on their profile and business requirements.
5. The Interact module checks whether a customer is whitelisted to be served by the Global Recommender or UNICA system and relevant offers are ranked and given to the customer.
6. The customer selects the appropriate offer, and the request is sent to Customer Billing System (CBS) for billing and provisioning.
7. CBS sends the transaction event to UNICA to record the revenues.
8. The UNICA system sends an email notification to the business on hourly basis for the inbound offers that have been purchased and the revenues generated.

8

**Gaps noted.**

* The data extraction jobs required to update the customer profile data in the Data Mart were not running as scheduled.
* Inaccurate and incomplete data stored within the Data Mart was relied on to give offers to the customers. The business decided on when to refresh offers applicable to customers.
* There were inbound channels that had not been integrated with the UNICA system as part of the business requirements: M-PESA and MySafaricom Apps, Safaricom web, Emails, and Social media.
* Voice offers and retail CVM were not implemented in the UNICA system as per the business requirements. A decision was made to retain voice offers on the legacy Tunukiwa system.
* The Machine Learning modules were not implemented within UNICA as per the contract. The business decided to use Global Recommender as the Machine Learning engine which has not covered all customers services (voice, SMS, M-PESA, FTTH) and only targets 5.7M customers.
* The UNICA system sent revenue reports for the offers purchased via email. There was no inbuilt reporting module implemented.

5

4

3

8

**Emails**

(Revenue Reports)

7

6

6

4

3

**CBS** (Provisioning)

Global Recommender (Machine Learning)

5

**DataMart** (Customer profile)

1

**UNICA Interact Module** (Offers)

**USSD** (Channel)

**Customer**

2

1

**EXECUTIVE SUMMARY – Safaricom’s utilization of the UNICA system**

Assessment of Safaricom’s level of utilization of the campaign management system.

**Safaricom CVM Level**

**Level 1: Basic**

**(Ad Hoc and Static)**

* A centralized Campaign Management System (CMS) is in place and used in an ad hoc and reactive manner to support campaigns.
* There is no clear strategy or plan for using the CMS to achieve CVM goals.
* Campaigns are often siloed by channel and department.
* It is difficult to track and measure campaign performance.
* Data and analytics are not used effectively to segment customers and target them with relevant campaigns campaign management system.

**Level 2: Intermediate**

**(Reactive)**

* A centralized campaign management system used to execute basic campaigns, such as mass email or SMS blasts.
* Campaigns are still managed largely manually.
* Data and analytics are used to some extent to segment customers and target them with relevant campaigns.
* Campaigns are targeted to broad segments, but they are not personalized.
* Campaign performance is tracked and measured, but it is often difficult to get a complete picture.

**Level 3: Advanced**

**(Structured and Proactive)**

* A sophisticated campaign management system is being used effectively to manage campaigns across all channels and used to execute highly personalized and omnichannel campaigns that are integrated with other CRM systems.
* Customer data is integrated with the campaign management system, allowing for automated targeted and personalized messaging or cross-selling campaigns.
* Campaign performance is tracked and measured in detail, and there is a well-defined process to use insights for optimization and continuous improvement of the future campaigns.

**Level 4: Optimized**

**(Managed and Focused)**

* Campaign performance is triggered and optimized in real time, using advanced analytics and machine learning to predict customer behavior and personalize campaigns.
* Campaigns are highly targeted and personalized, based on deep insights into customer behavior and preferences campaign performance that can be used to improve customer value.
* The campaign management system is used to orchestrate customer experiences across the entire customer lifecycle and transform the way the company interacts with its customers and delivers value.
* Real-time churn prediction - flagging customers with highest flight risks based on behaviors, resulting in company categorizing whom to prioritize for retention.
* Fully integrated multi-dimensional 360 views of customers enabled by data ocean.

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**EXECUTIVE SUMMARY – Key Highlights**

| # | Improvement opportunity | Agreed action |
| --- | --- | --- |
| **1** | **Data inconsistency and inaccuracies impacting CVM activities contrary to design, contract and best practices. (Rating: Medium)**  Complete, accurate, timely and reliable data is essential for effective campaign management. Reliability of data enables the business to **better understand the target customers, create more targeted and effective campaigns and measure the success of campaigns.** As per best practice, a data mart helps campaign management teams to achieve this by providing a single source of truth for all campaign data. A data mart is a subset of a data warehouse that is focused on a specific line of business, such as marketing campaign management. Data marts are typically smaller and easier to use than data warehouses, and they can be tailored to the specific needs of the business team that will be using them.  As per the request for proposal (RFP), contract, requirements, technical design and best practices, data meant for campaign management was to be channeled by Safaricom from all data sources to a data mart to facilitate automated real-time campaigns based on verified complete and accurate data. However, upon implementation, the data availed on the data mart could not be relied upon leading to Safaricom teams manually extracting analyzing and sharing Excel/CSV files with IBM to trigger daily campaigns.  The need for an automated CVM tool for campaign management and execution highlighted in the contractual requirements was not realized. As a result, the following challenges were faced:  **Outbound Campaign Challenges**   * 21 of the 23 outbound campaigns had not been automated as anticipated in the functional requirements due to inaccurate data in the data mart leading to daily campaigns being triggered through manual extraction of data from the BI data warehouse and running them from EXCEL and CSV data files. **Due to the manual operations with Excel files, data governance was sub-optimal since it was difficult to establish the accuracy of target customers for the daily files, expected targeting consistency of customers since most campaigns were not consistently sent during the review period and measurement of campaign success e.g. revenue uplift for outbound campaigns was impaired.**   **Inbound Campaign Challenges**   * By design, inbound campaigns depend on real-time data to offer relevant offers to the customers. The data source for the customer profiles from which UNICA system displayed the applicable inbound offers had not been updated for over 2 months despite being scheduled to be updated on daily basis. Therefore, analysis of offers given to customers relied on outdated data and could be inaccurate since the customer spent habits and ARPU change with time. The team relied on a manual refresh of the customer profiles. However, there was no documented process on when such refreshes should be carried out and on what frequency.   Initial discussions with the team indicated that the automated ETL jobs that were supposed to update both inbound and outbound source tables in the DataMart were not running as scheduled. This is because the data extraction jobs which were developed by IBM were unreliable leading to incomplete campaign data. | * We updated the data feeds in October 2023 and are currently monitoring the accuracy and completeness of the feeds till December 2023 with a target to ensure that 50% of the campaigns are running automatically from the data mart.   **Agreed owner: Gideon Mumo , Kamau Maina**  **Agreed Due Date: 31 December 2023**   * For inbound campaigns, the automated refresh of the customer profiles led to increase in demand at customer care centers due to customer complaints because the offers displayed were changing frequently. Manual refreshes as guided by the business reduced these complaints. * The business shall come up with a process design document to guide on the frequency when the customer profiles shall be updated and the required approval process for such refreshes.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 31 January 2024** |
| **2** | **Payments made for UNICA Machine Learning modules that were not being utilized. (Rating: Medium)**  Machine learning (ML) models are key for leading campaign management programs. ML models are used to automate tasks, personalize campaigns, and predict customer behavior. This helps marketers to improve their campaign performance and achieve better results.  Safaricom paid USD 130,800 to IBM East Africa for machine learning models that were not implemented as outlined in the signed contract. As part of the key areas of interest and non-negotiable requirements highlighted in the RFP for provision of a CVM tool, Safaricom highlighted the need for Big data and Machine Learning adoption for efficient campaign management. Therefore, the company signed a contract with IBM East Africa for provision of a churn prediction model at a cost of USD 120,000 (exclusive of VAT) as part of the UNICA system implementation. On 27 October 2021, Safaricom received a milestone acceptance letter from IBM for the completion of the 5th project milestone, “Completion of 1st Analytical Model – Go Live” and signed it on 28 October 2021 as a confirmation. An invoice was later raised on 09 November 2021 and USD 130,800 paid on 16 December 2021 for this first analytical model go live. IBM also committed to deliver 4 Additional Data Models per year throughout the 5-year contract period. However, these models were not implemented.  Subsequently, we noted Safaricom signed a contract with Ecosystem NXT PTY LTD on 01-November-2021 for the provision of Global Recommender (GR) worth USD 420,905 for a period of 3 years to provide real-time recommendations of offers to customers. Safaricom paid the vendor USD 75,937.50 on 09 June 2022 for platform licenses and a further USD 112,661.50 on 22 June 2022 for Global Recommender implementation. However, the platform only covered 5.7M customers and had not been extended to the entire base of subscribers and did not cover voice, SMS, M-PESA and FTTH services. | * The churn prediction machine learning models were part of the UNICA platform and could not be isolated from the cost of the entire UNICA implementation. The payment was made as part of the system implementation cost. The business made the call not to use the machine learning models that had been developed in UNICA as a strategy to develop internal capabilities in machine learning. The business also got other functions delivered beyond the agreed like integration to global recommender. * We will implement a plan where all customers will have the capability to view all offers including the offers from machine learning models from October 2023 for all subscribers .as from October 2023.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 15 November 2023**   * So far, we have 10 machine learning models some previously developed before UNICA implementation. The team shall develop a plan to extend the Global Recommender functionality to serve the entire subscriber base for voice from the 5.7M in October 2023. Once the target group outperforms the control group, we will migrate the full base.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 31 March 2024** |

**DETAILED IMPROVEMENT OPPORTUNITIES**

**DETAILED IMPROVEMENT OPPORTUNITIES**

1. **Data inconsistency and inaccuracies impacting CVM activities contrary to design, contract, and best practices.**

|  |  |  |  |
| --- | --- | --- | --- |
| Improvement opportunity | | | |
| Complete, accurate, timely and reliable data is essential for effective campaign management. Reliability of data enables the business to **better understand the target customers, create more targeted and effective campaigns and measure the success of campaigns.** As per best practice, a data mart helps campaign management teams to achieve this by providing a single source of truth for all campaign data. A data mart is a subset of a data warehouse that is focused on a specific line of business, such as marketing campaign management. Data marts are typically smaller and easier to use than data warehouses, and they can be tailored to the specific needs of the business team that will be using them.  As per the request for proposal (RFP), contract, requirements, technical design and best practices, data meant for campaign management was to be channeled by Safaricom from all data sources to a data mart to facilitate automated real-time campaigns based on verified complete and accurate data. However, upon implementation, the data availed on the data mart could not be relied upon leading to Safaricom teams manually extracting analyzing and sharing Excel/CSV files with IBM to trigger daily campaigns.  The need for an automated CVM tool for campaign management and execution highlighted in the contractual requirements was not realized. As a result, the following challenges were faced:  **Outbound Campaign Challenges**   * 21 of the 23 outbound campaigns had not been automated as anticipated in the functional requirements due to inaccurate data in the data mart leading to daily campaigns being triggered through manual extraction of data from the BI data warehouse and running them from EXCEL and CSV data files. **Due to the manual operations with Excel files, data governance was sub-optimal since it was difficult to establish the accuracy of target customers for the daily files, expected targeting consistency of customers since most campaigns were not consistently sent during the review period and measurement of campaign success e.g. revenue uplift for outbound campaigns was impaired.** * We noted that the data sources within the data mart were not updated frequently as per the set schedules leading to incomplete and inaccurate data that could not be relied on for outbound campaign execution. 10 DataMart data sources that were supposed to be updated daily basis had not been updated as scheduled with some having been updated over 8 months ago as at 20 September 2023. For instance, the subscriber profile table for outbound campaigns was last updated on 25 January 2023, the subscriber monthly usage table on 03 July 2022, M-PESA inactive days on 25 August 2023, do not disturb list on 14 July 2022, the CVM VIP list on 11 April 2022, while the daily Data, Voice, SMS, M-PESA, and Total usage reports were last updated on 02 September 2023. As a result, out of 23 outbound campaigns that were supposed to be automated as part of the requirements, only two (Kindergarten and Birthday campaigns) were running automatically although with gaps noted in some days.   **Inbound Campaign Challenges**   * By design, inbound campaigns depend on real-time data to offer relevant offers to the customers. The data source for the customer profiles from which UNICA system displayed the applicable inbound offers had not been updated for over 2 months despite being scheduled to be updated on a daily basis. Therefore, analysis of offers given to customers relied on outdated data and could be inaccurate since the customer spending habits and ARPU change with time. The team relied on a manual refresh of the customer profiles. However, there was no documented process on when such refreshes should be carried out and on what frequency.   Initial discussions with the team indicated that the automated ETL jobs that were supposed to update both inbound and outbound source tables in the DataMart were not running as scheduled. This is because the data extraction jobs which were developed by IBM were unreliable leading to incomplete campaign data. | | | |
| Risk | | **Rating** | **Medium** |
| * Inability to fully realize the envisioned benefits of CVM. Like accurate targeting and measurements of campaign success * Loss of potential revenue resulting from campaigns sent to wrong customer base. | | | |
| Recommendation | | | |
| * Solve underlying data quality issues in BI that feed DataMart to ensure UNICA executes campaigns based on accurate data. * Automate ingestion of data into the DataMart to avoid manual data extractions. * Document an operational process to outline the frequency and approval mechanism of updating customer profiles for inbound offers. | | | |
| Management Comments and Agreed Action | | | |
| * We updated the data feeds in October 2023 and are currently monitoring the accuracy and completeness of the feeds till December 2023 with a target to ensure that 50% of the campaigns are running automatically from the data mart.   **Agreed owner: Gideon Mumo , Kamau Maina**  **Agreed Due Date: 31 December 2023**   * For inbound campaigns, the automated refresh of the customer profiles led to increase in demand at customer care centers due to customer complaints because the offers displayed were changing frequently. Manual refreshes as guided by the business reduced these complaints. * The business shall come up with a process design document to guide on the frequency when the customer profiles shall be updated and the required approval process for such refreshes.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 31 January 2024** | | | |
| Agreed owner | Gideon Mumo / Kamau Maina | | |

1. **Payments made for UNICA Machine Learning modules that were not being utilized.**

|  |  |  |  |
| --- | --- | --- | --- |
| Improvement opportunity | | | |
| Machine learning (ML) models are key for leading campaign management programs. ML models are used to automate tasks, personalize campaigns, and predict customer behavior. This helps marketers to improve their campaign performance and achieve better results.  Safaricom paid USD 130,800 to IBM East Africa for machine learning models that were not implemented as outlined in the signed contract. As part of the key areas of interest and non-negotiable requirements highlighted in the RFP for the provision of a CVM tool, Safaricom highlighted the need for Big data and Machine Learning adoption for efficient campaign management. Therefore, the company signed a contract with IBM East Africa for the provision of a churn prediction model at a cost of USD 120,000 (exclusive of VAT) as part of the UNICA system implementation. On 27 October 2021, Safaricom received a milestone acceptance letter from IBM for the completion of the 5th project milestone, “Completion of 1st Analytical Model – Go Live” and signed it on 28 October 2021 as a confirmation. An invoice was later raised on 09 November 2021 and USD 130,800 was paid on 16 December 2021 for this first analytical model to go live. IBM also committed to delivering 4 additional data Models per year throughout the 5-year contract period. However, these models were not implemented. Discussions with the team indicated that Safaricom had already existing CVM machine learning models for churn prediction way before the UNICA was onboarded, and therefore, there was no need to implement the same models within the UNICA platform. This led to a total opportunity cost of USD 130,800 which was not recovered.  Subsequently, we noted Safaricom signed a contract with Ecosystem NXT PTY LTD on 01-November-2021 for the provision of Global Recommender (GR) worth USD 420,905 for a period of 3 years to provide real-time recommendations of offers to customers. Safaricom paid the vendor USD 75,937.50 on 09 June 2022 for platform licenses and a further USD 112,661.50 on 22 June 2022 for Global Recommender implementation. However, the platform only covered 5.7M customers and had not been extended to the entire base of subscribers and did not cover voice, SMS, M-PESA and FTTH services.  The following three models were developed in GR to serve an initial subscriber base of 5.7M low-value customers divided into four cohorts for data offers:  i) **Churn / Survival** - predicting customers who will churn  ii) **Inactivity** - customers who are inactive  iii) **Giga** - customers likely to use 1GB  An analysis of the performance reports for Cohort 1 and 2 which had been tracked between 01 January 2023 and 05 March 2023 indicated that the performance of the Target Group (TG) of customers served by the models was less than the Control Group (CG) of customers not served by the models, yet the two groups were drawn from a customer population with similar spent habits. This was caused by the machine learning models relying on data that was not being updated since access to the BI as a data source had been revoked. Consequently, the team was not able to track the performance of these models from April 2023 to September 2023. Once the access was reinstated in September 2023 the team generated a performance report which indicated an overall uplift of 1.66% from the machine learning models when compared to the Tunukiwa control group, despite facing data access issues. However, there was no clear plan of deploying the models to serve the entire subscriber base for data offers, as well as onboard voice, SMS, M-PESA, FTTH and other services to be served through Machine Learning. | | | |
| Risk | | **Rating** | **Medium** |
| * Unnecessary company expenditure resulting from payment for services not delivered. * Inability to reap full benefits realizations arising from implementing Machine Learning models to serve a broader base of customers. | | | |
| Recommendation | | | |
| * Recovery of the cost for services not delivered by IBM. * Document a plan of implementing the Global Recommender to serve the rest of the subscriber base. | | | |
| Management Comments and Agreed Action | | | |
| * The churn prediction machine learning models were part of the UNICA platform and could not be isolated from the cost of the entire UNICA implementation. The payment was made as part of the system implementation cost. The business made the call not to use the machine learning models that had been developed in UNICA as a strategy to develop internal capabilities in machine learning. The business also got other functions delivered beyond the agreed like integration to global recommender. * We will implement a plan where all customers will have the capability to view all offers including the offers from machine learning models from October 2023 for all subscribers .as from October 2023.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 15 November 2023**   * So far, we have 10 machine learning models some previously developed before UNICA implementation. The team shall develop a plan to extend the Global Recommender functionality to serve the entire subscriber base for voice from the 5.7M in October 2023. Once the target group outperforms the control group, we will migrate the full base.   **Agreed owner: Gideon Mumo**  **Agreed Due Date: 31 March 2024** | | | |
| Agreed owner | Gideon Mumo / Kamau Maina | | |

1. **The business requirements were not fully met.**

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| Improvement opportunity | | | |
| The CVM solutions implemented did not meet key areas of interest and non-negotiable requirements tabled in the RFP document. Safaricom intended to have a solution to manage real-time contextual push marketing campaigns for Voice, Data and M-PESA for both inbound and outbound campaigns. We noted the following key requirements that were not met:  **Inbound Voice Offers had not been implemented.**  The UNICA system did not have enough capacity to handle the huge traffic that is generated from voice transactions. There were three attempts on 07 October 2022, 25 November 2022 and 01 March 2023 to migrate voice offers from the in-house legacy Tunukiwa system for the whole customer base to UNICA system, but the attempts failed due to system capacity issues. The team resorted to a phased rollout approach for voice offers by onboarding an initial whitelist of 1M customers on 05 June 2023 to be served by UNICA. These customers were randomly selected from the voice base of 2 months. However, there was no clear plan of migrating the remainder of the voice subscriber base to the UNICA platform.  **Inbound Customer Channels not Integrated with UNICA.**  The following channels through which UNICA system gave offers to customers had not been implemented as at the time of the review:   * The M-PESA and MySafaricom Apps. * Safaricom web. * Email integration was still underway. * Social media was to be done through a vendor appointment and the process had not started yet. * Retail CVM   + Linking all Trade Agents to sell CVM offers in Trade.   + Agents can pay for customer offers using Agent M-PESA Float, Airtime / M-PESA.   + Ability to pay agents their commissions for successful recommendations via M-PESA on specific day.   **Campaign Operations**   * IBM was required to provide robust approval portal that would ensure no campaign could be executed without approvals. However, there was no approval mechanism implemented in the UNICA portal as the Safaricom team shared with IBM the campaigns to be run through e-mails.   **Reporting**   * The BIRT module which was supposed to provide real time update of reports for outbound campaigns had not been implemented.   **Outbound Use Cases**   * Out of 23 outbound campaigns that were supposed to be implemented end to end, only two campaigns had been automated although we noted instances where the campaigns did not run as scheduled. From 01 April 2023 to 24 September 2023 the Kindergarten Campaigns ran on 124 days while the birthday campaigns ran for 96 days out of a duration of 176 days. | | | |
| Risk | | **Rating** | **Medium** |
| * Safaricom risks not meeting its objective of growing its revenue through CVM | | | |
| Recommendation | | | |
| * Integrate UNICA platform to all the inbound channels as required. * Automate all the outbound campaigns to remove manual interventions. * Provide a mechanism to report on revenue and conversions from the campaigns that were run. * Implement voice offers on the UNICA inbound campaign module as per the contractual agreement. | | | |
| Agreed action | | | |
| * Voice offers shall be retained on the legacy Tunukiwa platform and shall not be migrated to the UNICA system. The business plans to upscale in-house Tunukiwa system such that by the time the UNICA system comes to end of life then the Tunukiwa system can handle both inbound and outbound campaigns across Voice, Data and M-PESA. * The remaining UNICA requirements shall be handled during the implementation of the new DataMart. The team shall share a roadmap on when the implementations shall be done.   **Agreed Owner: Gideon Mumo**  **Agreed Due Date: 31 January 2024** | | | |
| Agreed owner | Gideon Mumo / Kamau Maina | | |

1. **Inability to report on revenue and conversions from CVM campaigns.**

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| Improvement opportunity | | | |
| The UNICA system lacked a reporting module that could be used to track revenues and conversion rates for outbound campaigns making it difficult to ascertain whether the campaigns were working as intended. For inbound campaigns the system sent email notifications outlining the revenues and conversions per campaign on an hourly basis. As part of the system implementation, IBM were supposed to install BIRT (Business Intelligence Reporting Tool) to support on reports for outbound campaigns. However, this was not implemented making it difficult to track revenues and conversions for the campaigns executed. The UNICA system sent email notifications on delivery reports for the outbound campaigns that ran on a particular day.  In addition, the technology support team agreed to develop these revenue reports from the Business Intelligence (BI) platform. As at the time of the review, no report had been developed to enable the business teams track revenues from the outbound campaigns. For inbound campaigns, the CVM operations team relied on email notifications that outline the revenues generated per day from the offers that customers purchased. There was no centralized reporting module in the UNICA or BI platforms that could give the business operations teams visibility of how their campaigns are performing. For non-revenue campaigns there was no feedback mechanism on assessing the effectiveness of the campaign. The solution did not meet the Safaricom objective of demonstrating dashboards, reporting and analytics. Therefore, it was difficult for Safaricom to gauge whether the CVM initiatives are working as intended. | | | |
| Risk | | **Rating** | **Medium** |
| * Inability to track performance of CVM related campaigns | | | |
| Recommendation | | | |
| * Develop reports in the UNICA platform to track revenues for both inbound and outbound campaigns. Both the CVM and business operations teams should be granted access to these reporting modules to provide transparency and visibility of their campaign performance. | | | |
| Agreed action | | | |
| * Revenue reporting should be available via enterprise BI dashboards (Qlik). * The data mart currently under development will focus primarily on campaign data, but will include general reporting of campaign performance.   **Agreed owner: Kamau Maina**  **Agreed Due Date: 31 January 2024** | | | |
| Agreed owner | Kamau Maina / Gideon Mumo | | |

1. **The UNICA platform had open high risk cybersecurity issues.**

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| Improvement opportunity | | | |
| The UNICA system was running on operating systems and databases with open high risk cybersecurity issues, posing cyber-risks to the CVM ecosystem and the greater Safaricom environment. The operating systems on two Middleware servers had four high risk vulnerabilities that remained open for 99 days before they were closed while the UNICA databases had seven high risk issues that had not been resolved for over one year.  **Security Vulnerabilities on the operating systems of the Middleware servers.**  During an exercise that was done on 05 June 2023 to add more Middleware servers to support the UNICA platform, the cybersecurity team noted that operating systems of the two original Middleware servers where Safaricom offers had been configured were running on a lower unsupported version of Red Hat Enterprise Linux server (RHEL version 8.4) with the following open unpatched high risk security flaws that exposed the environment to cybersecurity attacks:   * The servers were running lower versions of the Simple Network Management Protocol (SNMP) that were inherently insecure. The primary function of SNMP is to provide network administrators with information about all kinds of network connected devices. It can be used to get and change system settings on a wide variety of devices, from network servers to routers and printers. The SNMP service that was running had default settings, known as community strings, that could be easily guessed by hackers to aid an attack. In addition, the service transmitted credentials in clear text that could be visible to hackers. * The Secure Sockets Layer (SSL) certificate used to encrypt data that is transmitted between different systems had not been signed by Safaricom Certificate Authority (CA). This could lead to transmitting of sensitive customer information in clear text and hackers could easily intercept this information and perform man-in-the-middle attack. * The operating system installed was running on vulnerable unsupported versions of Red Hat Enterprise Linux that contained unpatched security flaws. * The servers had vulnerable software installed e.g. Apache Log4j and Apache Tomcat servers that did not protect against Denial of Service attack risks associated with running over any untrusted network.   The issues were later addressed, and the last item was closed on 12 September 2023 after being open for 99 days.  **Security Vulnerabilities on the UNICA databases.**  Internal audit deployed a Continuous Auditing and Continuous Monitoring (CACM) tool that carried out automated security audit tests on four UNICA databases in line with the Safaricom Minimum Baseline Security Standards and Center for Internet Security (CIS) security guidelines for securing Oracle databases. The tool flagged seven high risk security issues on the databases on weekly basis that remained unresolved for over one year.   * The databases had not been patched within six months as guided by the Safaricom security standards. * The number of failed login attempts before accounts under the default profile could be locked had been set at 10 instead of 5 as per the security standards. * The audit trail features had not been enabled on the database, making it difficult to collect data for troubleshooting or monitoring queries executed on the database. * The local listener setting which specifies a network name that resolves to an address of the Oracle database had not been set up exposing the environment to TNS poisoning attack which allows hackers to redirect network traffic to another system by registering a different connection link. * The password verify function used to enforce strong password restrictions had not been set for accounts provisioned under default and DBA profiles. * The number of concurrent connections per user for accounts under the default profile had been set to UNLIMITED against a standard recommendation of 10. This exposed the database to intentional Denial-of-Service attacks and the database could not prevent memory resource exhaustion by poorly formed requests. * One human user account had been granted excess administrative privileges on the database opening the door to data breaches, integrity violations, and Denial-of-Service attacks. The security standards recommend restricted assignment of the DBA role. | | | |
| Risk | | **Rating** | **Medium** |
| * Open cybersecurity threats expose the Safaricom environment to attacks from hackers. | | | |
| Recommendation | | | |
| * Re-scan all the UNICA assets and close all open items. | | | |
| Agreed action | | | |
| * These issues were resolved. We will have cyber security perform scans across all assets to validate closure and close any arising items by 31 January 2024.   **Agreed owner: Kamau Maina**  **Agreed Due Date: 31 January 2024** | | | |
| Agreed owner | Kamau Maina | | |

1. **Over-reliance on the vendor to develop and execute campaigns.**

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| Improvement opportunity | | | |
| As at the time of the review, there was no inhouse Safaricom staff member who had knowledge and skills to develop and execute campaigns. The business relied entirely on the vendor in as much as there was a two-week training carried out after project implementation for Safaricom staff and covered campaign management and execution. In addition, there was no plan documented for skills transfer as part of the handover process to avoid overreliance on the vendor. | | | |
| Risk | | **Rating** | **Low** |
| * Overreliance on the vendor for campaign executions and management | | | |
| Recommendation | | | |
| * Develop a plan to train and upskill the Safaricom team on campaign development and execution | | | |
| Agreed action | | | |
| * The vendor has one onsite resource to help Safaricom in executing the campaigns as per the contract signed. * The business plans to upscale Tunukiwa system such that by the time the UNICA system comes to end of life then the Tunukiwa system can handle both inbound and outbound campaigns.   **Agreed Owner: Gideon Mumo**  **Agreed Due Date: 31 January 2024** | | | |
| Agreed owner | Gideon Mumo | | |

**Graphical user interface

Description automatically generated with low confidence**