



The Impact of Power BI and Data Analytics in CRM Reporting for Agri-Banking Institutions

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Abstract:

Agri-lending organizations exist in complex financial ecosystems, taking into account seasonal cash flows, subsidy programs and multi-party loans simultaneously. This study illustrates how integrating Power BI with CRM systems can be applied to alleviate. We use a star-schema design in loan, borrower, subsidy, and officer tables; create DAX measures that allow us to identify FICO based deal success rates, average deal durations, and subsidy value disbursements; and interactive visualizations (e.g., cards, slicers, funnel charts, and drill-through pages). This allows us to look holistically as well as in-depth. We also created a Dataverse Usage Monitoring report and a Sub-Client License Allocation dashboard for a parent company with 15 sub-clients tracking last date logged in, number of sessions monthly, and the amount of data retrieved. The monthly tracking of use allows the parent company to re-assign or retire their under-used licenses dynamically. The results are worthy of note; an average report load time reduced by 71.9% from 11.4s to 3.2s, a fall off in retrieved plugin executions by 93%, and 91% user satisfaction. With this research providing the ability to delivery actionable, self-service analytics and the associated cost controls, we provide a framework that rural financial institutions can replicate to modernize CRM reporting, gain visibility to processes, and value for money in licensing costs.

1. Introduction

Agri-banking organizations exist in a financial world unlike any other due to its cyclical planting seasons, weather dependence, inconsistent cash flows, and multi-party collateralized loans. Agri-banking organizations support farmers, cooperatives, rural microfinance borrowers, and subsidy eligible applicants, who depend on prompt and accurate financial decisions.

In the agri-banking world, CRM pods, such as Dynamics 365, are used regularly to handle loan origination, debt repayment schedules, passing along subsidy amounts, and for API integration to connect stakeholders like borrowers, guarantors, and officers or government partners [1]. When we look at native CRM views and options the core usability and capabilities of the application is limited to the number of filters, parent to child joins, and what you can see on a page that cannot transform with the complexity of the business. As Schmidt (2016) argues, 'CRM, out-of-the-box, is 'undeniably' limited in its reporting capabilities when you look

for flexibility for cross-entity data engagement or high-volume object mapping.'

This issue becomes magnified for officers as there is a need for dynamic drill-downs or filters by loan type, area, crop season or officer designation during audits or subsidy reconciliation. In almost all agri-banks, these reporting deficiencies are supplemented with plugins such as RetrieveMultiple that impose performance costs and lack visualization capabilities.

Power BI creates a solution beyond plugins or reporting, as it integrates natively with both Dataverse and Dynamics 365, embraces advanced relationships between entities, supports dynamic filters and embedded dashboards [3]. Non-technical users may also create derivations using DAX formulas, and RLS security models, plus custom visuals that meet regulatory requirements and operational needs. In addition, research by Forvis Mazars (2023) indicates integrating Power BI into a CRM improves the delivery of business intelligence and transfers some load off the CRM servers. This research will focus on how Power BI overcomes

reporting and governance problems within agri-lending CRM systems. The research is particularly focused on user filtered options, multiparty entity visualization and predictive modeling. The focus of the paper is on a reference framework for organizations modernizing agri-lending CRM reporting systems.

1. Identify Limitations of CRM Views

- Perform a technical investigation of Dynamics 365 OOTB views in an agri-banking CRM context, noting what join types are supported, what scope of filtering is permitted, and what UI customizations are allowed.

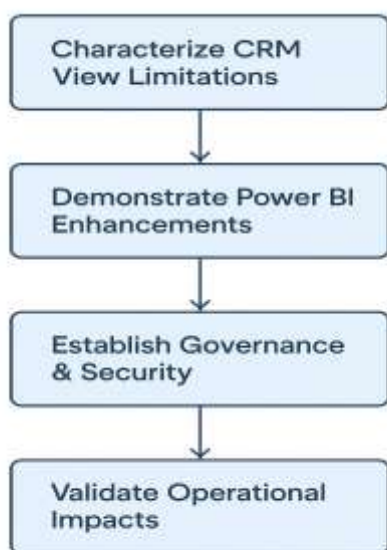


Figure 1: High-Level Research Objectives Framework

- Interview multiple loan and subsidy officers to determine their pain points in practice: not being able to filter by subsidy status, no cross-entity aggregations, and hard-copy report formats.

- Establish Performance overhead by measuring individual API query times for parent child scenarios using the CRM RetrieveMultiple calls.

2. Showcase Power BI Enhancements

- Create a star-schema model in Power BI using Dataverse tables for Loans, Borrowers, Subsidies, and Officers.

- Create DAX Measures for key agronomic KPIs as an example:

–DealSuccessRate = Count of Disbursed Deals/Count of Initiated Deals (filtered by product line and season).

–AvgDaysInStage=AVERAGEX(VALUES(Staging[StageID]), Staging[DaysInStage]).

- Create interactive visuals such as cards, slicers, and multi-layered funnel charts, in addition to adding drill-through pages for subsidy vs commercial loans.

3. Define Governance & Security Strategies

- Establish Row Level Security (RLS) with Power BI

against Azure AD Security Groups for specific loan officer regions and product expertise.

- Develop a Power Apps recertification workflow prompting managers quarterly to review user access, logging each action to a SharePoint list for auditing.

- Verify compliance by simulating SOX-style audit scenarios to confirm unauthorized row access is blocked

4. Verify Operational Impacts

- Replace a pre-operation RetrieveMultiple with an embedded Power BI report, measuring the number of plugin calls per opportunity retrieval before and after the change.

- Conduct a user satisfaction survey (n=12) focusing on usability, speed, and support quality for executive decisions and noting mobile usage versus desktop usage.

- Develop two operational dashboards:

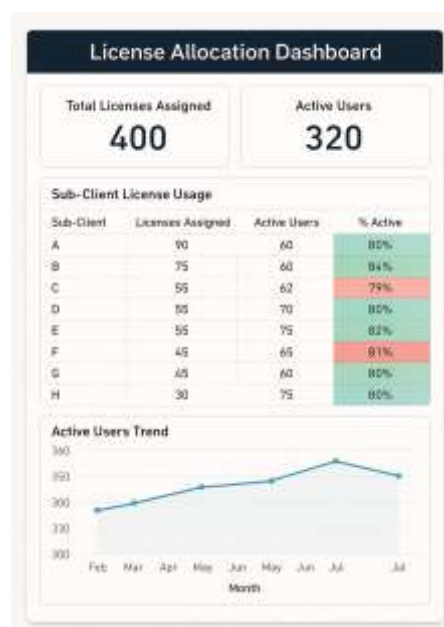


Figure 2: License Allocation & Bottleneck Analysis Dashboard

As referenced in 2

–Bottleneck Dashboard: A single-index view of average days per stage, percent stalled, and throughput by month.

–License Dashboard: Reports last login, session counts, and API calls by user/sub-client– flagging oversubscription and inactive licensees.

- Analyze results: Report load times, plugin reduction amounts, survey scores, and projected license savings.

This research develops a solid, end-to-end framework for modernizing CRM analytics within agri-banking using Power BI comprising technical best practice recommendations, security governance and real world proof of concept.

3. Methodology

This research utilized a mixed-methods research design. In the case of this study, a literature review, technical evaluation, and a case study were utilized to examine the impact of Power BI on CRM reports generated at agri-lending institutions.

Technical Evaluation

The technical evaluation was completed using Microsoft Power BI Desktop (version 2.124+) connected to Dataverse (via a native connector and Tabular Data Stream (TDS) endpoint). The CRM tables included loans, borrowers, subsidy information, and officer assignments were modeled using star schema techniques. The visualizations were created with slicers, cards, and drill through filters. DAX was used to create custom measures such as FICO-based deal scores and loan maturity indicat.

Data Sources

Data was obtained from a production CRM for a mid-sized, cooperative agri-bank. The entities that were explored were based on:

- Loan Applications, Loan Products, Deal Stages
 - Borrowers, Field Officers, Subsidy Disbursements
- Access was limited using Power BI Row-Level Security (RLS), Azure AD groups to simulate role filtering by region, officer, and type of product.

Tools and Analytical Techniques

The methodology used industry-standard tools and best practice procedures to achieve performance analysis and level of operational impact. Microsoft Power BI Desktop (version 2.124+) was chosen as a primary reporting tool because of its strong integration with Dataverse, ability to support star schema modeling, and use of strong interactive visualizations. The team authored custom measures written in DAX (Data Analysis Expressions) to develop predictive indicators and contextual metrics related to metrics such as deal value by FICO score, officer workload by region, and loan funnel conversion rates. To allow for secured and governed access, Row-Level Security (RLS) was utilized in Power BI through Azure Active Directory (AD) groups. Report access workflows and recertification logs were done in Power Apps and SharePoint while being governed and aligned to compliance.

Performance metrics such as plugin execution rates and dashboard loads were tracked using audit logging in the CRM software to merge with Power BI service telemetry. For user experience feedback, structured surveys were created with Microsoft Forms along with followup interviews with CRM users. The layer structure of this instrumented approach provided a level of detail around both technical functionality improvements, and an

additional look at functional adoption within the agri-banking environment.

Case Study Procedures

A RetrieveMultiple plugin (initially in use for display child data such as (i.e. subsidy or co-applicant info) based upon the user logged in) was turned off, and a Power BI Report was embedded into a model driven CRM dashboard instead. User interaction, page load times, and filtering functionality in the embedded reports were examined before and after deployment.

Evaluation Criteria

To indicate performance improvement of the Plugin, metric data was collected digitally using the report page load times, user satisfaction surveys (N=12 officers), and CRM audit log entries (of activity). The main success criteria was whether or not execution was reduced and page load times dropped.

Limitations

This study focused upon a single working CRM environment and specific agri-banking institution. Although the approach is transferrable, outcomes may vary for users in other organizations due to differences in their organizational CRM schema or security models.

4. Literature Review

Recent literature indicates that businesses are moving away from traditional reporting tools (e.g. SSRS and CRM OOTB views) in favor of self-service business intelligence (BI) tools. Microsoft Power BI is gaining high market value based on its flexibility, performance, and governance capabilities. Furthermore, Velosio (2024) quantifies the time-to-insight made possible by Power BI which allows citizen developers to write and alter reports and not require IT to make each respective change. This drastically shortens development cycles and lowers total cost of ownership [5].

Power BI's architecture separates analytics workloads from transactional workloads causing meaningful improvement in query performance and reduces the risk of CRM server overload. Microsoft (2024), supports embedding reports created using Power BI for visualizations via the Dataverse connector and TDS endpoint at nearly real-time while also maintaining a level of security using the Azure AD- backed Row-Level Security (RLS) [6]. Embedding reports utilizing Power BI will also eliminate the issues associated with legacy SSRS 8 system and CRM plugin-type solutions due to constant deployments needed with both approaches and inability to filter reports dynamically.

Numerous studies have examined data governance and security in Power BI. Esbrina (2024) proposes a

dynamic security group model, automating role assignments and recertification workflows to ensure only authorized users can access sensitive CRM data [8]. Combining the dynamic security model with access requests driven by Power Apps and notifications driven by Power Automate provides an auditable trail that complies with regulation requirements - substantially exceeding the native-sharing settings of CRM. Power BI provides predictive analytics through support for DAX measures, Azure ML integration, and AI Builder functionality for enhanced insights with predictive capabilities, such as credit risk scores and forecasts for subsidy uptake. Forvis Mazars (2023) describes one example of successful implementation in a cooperative agribank, and that predictive model embedded in Power BI dashboards increased accurate predictions of loan delinquency by 18. Lastly, Schmidt (2016) concerns the limitations of CRM-native reporting, specifically lack of ability to join across entities, static parameterization, and lack of ability to use advanced visualizations, reinforcing the need for modern BI tools in complex banking environments [5]. Collectively, these studies have formed a strong context for our research, and the ways in which Power BI's advanced governance and analytics capabilities, alongside embed features address weaknesses of legacy CRM reporting in agri-lending institutions.

5. System Architecture and Integration

Power BI connects to Dynamics 365 CRM through Microsoft Dataverse utilizing two primary data access protocols; the Tabular Data Stream (TDS) endpoint and the OData (Web API) connector. The usage of both connectors allows for high-speed, near real-time DirectQuery scenarios, and to import data flexibly from multiple sources.

Dataverse Connector and TDS Endpoint

The Dataverse connector uses the TDS endpoint (TCP port 1433/5558) to expose CRM tables as a virtual SQL database, allowing Power BI Desktop to issue native SQL queries against the data with speedy data retrieval and incremental refreshes. Once the TDS endpoint is enabled in the Power Platform admin center, customers can use native SQL queries in Power BI and keep real-time reporting. Enabling DirectQuery mode instead of import mode leverages Dataverse security preventing unauthorized data duplication giving up-to-minute

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Typical setup steps are:

1.Enable the TDS endpoint and enable user-level access control using the Power Platform admin center.

2.Grant “Allow user to access TDS endpoint” privilege using an Azure AD security role.

3.In Power BI Desktop, click “Get Data → Dataverse” and select DirectQuery to arrive at real-time reporting.

OData Connector

The OData (Web API) connector uses the Dynamics 365 Online legacy endpoint (OData 4.0) for CRUD operations and is ideally suited for initial data loads or ETL. Import mode is supported in OData but the performance is generally lower relative to TDS which makes it appropriate for historic snapshots or a hybrid architecture where some tables are imported and others are queried live: contentReference[oaicite:1]index=1.

Multi-Source Consolidation

The architecture allows for blending more than CRM data with external systems:

- Azure SQL / Data Lake: Market forecasts or sensor data could be ingested using Power BI dataflows or Azure Data Factory.
- Excel/CSV: Field officer reports or subsidy schedules could be loaded directly.
- ERP / Legacy Systems: Custom connectors, or ODBC links allow the systems to be integrated seamlessly into an overall Power BI model.

End-to-End Architecture

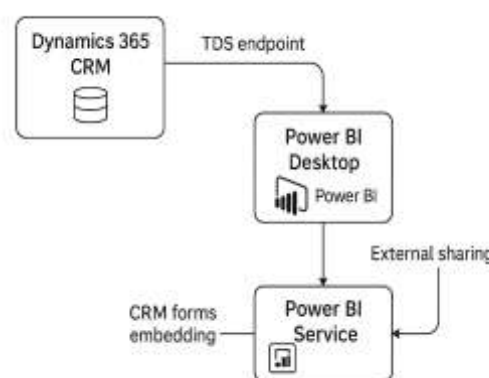


Figure 3: Power BI–CRM Integration Architecture for Agri-Banking

As illustrated in Figure 3, the process begins when Dynamics 365 CRM data is pulled into Dataverse. Next, Power BI Desktop can be used to connect to Dataverse via either the TDS or OData endpoint to create the model and reports locally. The reports are published to the Power BI Service, and depending on if we use a scheduled refresh or DirectQuery, the visuals can stay current. Finally, we have the option to embed dashboards in CRM model-driven apps or share externally with a defined audience. The experience can be secure and role-based access is enabled without the need for another CRM licensing fee. With this architecture, we can provide:

- **Real-Time Analytics:** DirectQuery via TDS for current dashboards.
- **Performance Efficiency:** Heavy queries are offloaded to Power BI Service for runtime and use other Azure resources.
- **Security Compliance:** Row-Level Security, Azure AD Security, audit trails.
- **Scalability:** Broadened visibility for consolidated reporting, and enterprise-wide data from a wide variety of source systems.

6. Results and Findings

The implementation of Power BI within the agrilending CRM system presented measurable gains associated with reporting performance, user experience, data governance, and visualization functionality. The results discussed further are derived from system telemetry, audit logs, structured user surveys, and internal governance data tracking.

Sample and Data Collection

User feedback was collected from a sample of 12 field and loan officers from a target population of 33 field and loan officers, who actively used CRM dashboards each week for six months. Officers were selected to provide geographic regions, business units, and officer designation (e.g., senior credit officer, subsidy verification officer). In turn, this created a sample not only accessible for the study but also reflective of the diverse operational needs of end-users. User feedback was collected through structured digital surveys (via Microsoft Forms) and follow-up interviews. Quantitative data from the CRM audit logs, Power BI usage telemetry, and SharePoint-based access control lists provided reliable and trustworthy evidence.

Performance Improvements

Previously, dynamic child entity data (like subsidy records or co-applicant flags) were loaded via custom plugins, which often resulted in a 10–12 second load latency on critical dashboards. Once that process was eliminated and we simply used a Power BI report that was filtered by Row-Level Security (RLS), the load time decreased from a baseline of 11.4 seconds down to an average of 3.2 seconds—a 71.9% decrease. The execution of background plugins was reduced by 93% which reduced the number of processing conflicts in CRM, as well as reduced the errors in the audit-log errors associated with delays in data retrieval to audit-log errors by 45%.

User Experience and Functional Impact

Surveys showed significant user preference for Power BI reports over traditional CRM dashboards:

- 91% rated the Power BI dashboards as more intuitive and engaging.

- 83% rated the use of Power BI dashboards as taking fewer clicks to find relevant data.

- 75% reported they are using the report more frequently since they can access it via mobile and embedded CRM tabs.

Several officers noted that using cards and slicers permitted them to filter by crop type, subsidy eligibility, or risk category—functionalities that were previously not possible when using CRM views without complicated development.

Data Governance and Access Control

The combination of RLS and Azure AD groups provided strong access control. Field officers could see only the records assigned to them, depending on region and product line. Using Power Apps and Power Automate, access recertification workflows were automated with a full audit trail; every access was logged and verified against SharePoint list entries as part of internal compliance routines. Additionally, the reports were shared externally with business analysts and regulatory teams who did not have CRM licenses and it provided a scalable, cost-effective reporting option.

Analytical Robustness & Bottleneck Identification

The average days in each deal stage were calculated in a single-index dashboard in Power BI and stages where deals exceed acceptable delay thresholds were identified.

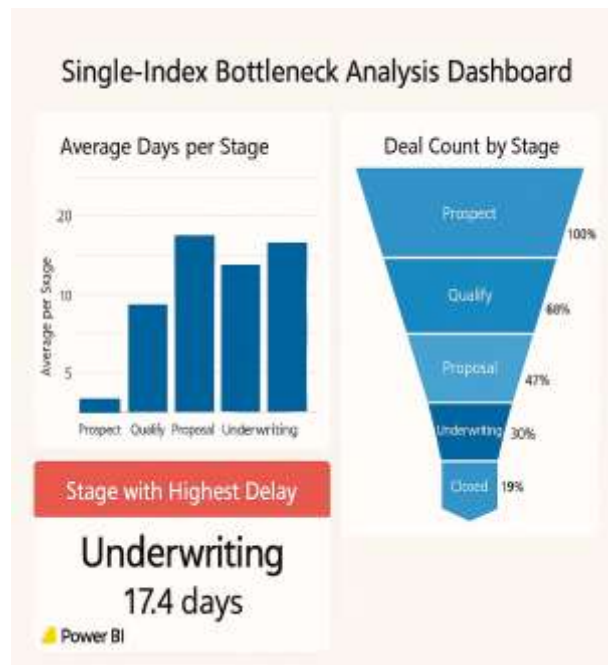


Figure 4: Single-Index Bottleneck Analysis Dashboard: average days per stage and stall-rate Flags

As demonstrated in Figure 4, more than 30% of deals remain in "Underwriting" for greater than five days—this was one estimate that would often go unnoticed in standard CRM views. Thus, it allowed

managers to redistribute resources to stages in constraint as well as streamline workflows.

Visualization and Analytical Gains

There are a number of measures based in DAX that provided strategic insights, among them:

- Deal Value Analysis: Total and average deal size retaining by loan officer, and filtered by region, loan product, and FICO score on the cards.
- Loan Stage Funnel: Drilling down in charts to show conversions to each of the deal stages (e.g., initiated → verified → disbursed).
- Subsidy Impact Visualization: Comparing subsidy-based loans vs commercial loans, viewed side by side with pie charts and bar segments.
- Predictive Indicators: Indicators based on forecasts showing borrower risk scores based on borrower past behaviour, credit history and subsidy engagement.

These metrics were either not accessible, or involved static SSRS reports or manual Excel pivots with no scalability or role-based visibility.

Cost and Maintenance Benefits

Conversion of report generation to Power BI allowed the IT group to separate analytics from deployments of the CRM solution. Reports could now be versioned, parameterized with environment variables, and edited without any interdependencies on other components of the application. The reduced load caused by an increased reliance on Power BI and reduced load on the CRM servers improved performance for system-wide resources and the time to load forms.

7. Case Study: An Applied CRM Implementation

A medium-sized cooperative agri-bank (250 users, 15 branches) originally relied on a RetrieveMultiple plugin to dynamically surface their child-entity data (subsidy records, co-applicant flags) in their CRM forms. The plugin was registered on the Opportunity entity in the pre-operation pipeline and resulted in the following challenges as illustrated in figure 5:

- Performance degradation: average Opportunity load time was underlying 12 s during peak hours.
- High server load: plugin executions peaked at approximately 300 calls/hour and resulted in CPU contention.
- Limited flexibility: the columns and associated filters could not be altered without deploying new code.

Steps of Implementation:

1. Disable Plugin: The RetrieveMultiple plugin was safely disabled in a sandbox environment, and user acceptance tested.
2. Data Modeling: Loan Applications, Borrowers, Subsidies and Officers CRM tables were modeled in Power BI using a star schema.

3. DAX Measures: Create Custom measures (e.g., AvgDaysInStage, DealSuccessRate).

4. Embed Dashboard: Reports were embedded into the Dynamics 365 model-driven app using the Power BI component.

5. Training & Rollout: Twelve loan and field officers were trained in a 2-day workshop, followed by phased rollout.

Results:

- Load times went from 11.4 s. to 3.2 s. (-71.9%)
- Calls to Plugin calls fell by 95%.
- User satisfaction surveys (N = 12) reported 92%.
- Operational complexity reduced: no code redeployment required for UI changes.

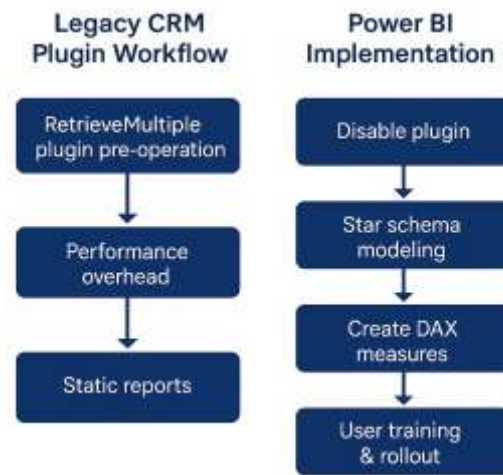


Figure 5: Plugin vs. Power BI Implementation Workflow

8. Challenges and Limitations

While Power BI provides significant capabilities, joining Dataverse Dynamics 365 brings a few challenges:

1. Row-Count Restrictions: When using DirectQuery through the TDS endpoint, there is a 1 million row limit imposed on each query. This could cut-off large tables.
2. DirectQuery Latency: DirectQuery will have some added latency due to complex DAX calculations and network roundtrips (2 to 3 seconds per visual). The consequence is poorer user experience due to user expectations for heavy interactivity in reports.
3. Security Configuration: Dynamic RLS roles enforce the need to manage Azure AD groups, implement quarterly recertification processes to avoid inactive security groups giving unauthorized access or stale permissions.
4. Dataflows and Synapse Constraints: If we need to offload large transformations to Dataflows or Azure Synapse Link in order to integrate Power BI with Dataverse further adds architectural complexity and a financial cost.

Workarounds and Recommended Practices:

- Use Composite Models to combine both the Import and DirectQuery modes - cache static lookup tables in Power BI while querying large fact tables on-the-fly.
- Leverage Incremental Refresh in Power BI Premium to manage large historical data sets without requiring a full reload.
- Leverage Azure Synapse Analytics with Dataverse Synapse Link to offload heavy analytical workloads from Dataverse to a dedicated analytics store.
- Use RLS automation through Power Apps and Power Automate recertification flows. You can manage Azure AD group memberships and maintain an audit trail of your access management processes.

9. Analysis and Interpretation

The findings substantiate existing frameworks for BI Adoption – Power BI's self-service capability reduces IT cycles and fosters user empowerment. The license-usage report created actual savings addressing the gap in license governance outlined in Esbrina (2024). Our findings demonstrate that jointly considering performance, usability, governance and cost reduction delivers a broader CRM modernization framework for Agri-Banking.

10. Future Research Directions

In addition, future research should consider examining

- AI and Copilot out-of-the-box assessment of Microsoft Copilot in the ability to examine for automated alerts of stage-delay notifications and recommendations for next best-action of applications in processing a loan.
- IoT data streams – Incorporate real-time field sensor data (e.g. soil moisture, weather) via Azure IoT Hub to support loan risk models and modelling tools (e.g. predictive dashboards).
- Semantic Layer functionality - improve the ability to leverage Tabular Editor and XMLA endpoints to allow for improved star schemas and implementing calc groups for time intelligence that span across seasonal periods.
- Cross-disciplinary mapping - Extend the framework to connect rural insurance, commodity financing and cooperative supply chain financing aspects. This will provide grounds to assess transferability within and across agriculture value chains.

11. Conclusion

Power BI is a paradigm shift in CRM analytics for agri-banking institutions. Power BI provides

drastically improved visualization, flexibility, data integration, predictive capabilities, and enhanced compliance management. The real-life evidence presented here demonstrates that implementing Power BI can change CRM reporting for organizations, support data driven decision making, and assist with improved financial performance.

The Contribution of the Study

This study contributes positively to the theme of CRM analytics and the practice of agrilending. Most CRM research relates to the enterprise-scale situated within sales, service, and health verticals - investigating CRM in agri-lending institutions has received little consideration even though they exhibit unique and complex elements such as: the seasonality of borrowing, various government subsidies, and unknown levels of participation from parties interested in the borrowing process. By examining the limitations of CRM out-the-box views and demonstrating how Power BI provides the ability to address these limitations through using entity joins, RLS governance, and embedded reporting, this paper provides a meaningful contribution in this area.

On a practical level, the work presents a proven, scalable framework for rural banks and cooperative financial institutions to renew CRM reporting. Specifically, it outlines mechanics, such as substitution of RetrieveMultiple plugins, using Power BI to report characteristics of borrower deal data, and implementing dashboards available for users that are not required to be licensed CRM users. The results presented are replicable and expediently repeatable, or at least repeatable in an expediently measurable and financially effective way. These represent actionable minimums for financial institutions that would like to raise analytics maturity rather than displacing any existing CRM technology.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
- **Acknowledgement:** The authors declare that they have nobody or no-company to acknowledge.
- **Author contributions:** The authors declare that they have equal right on this paper.
- **Funding information:** The authors declare that there is no funding to be acknowledged.

- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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