Fraud and Performance Monitoring of Credit Card Tokenization Using Business Intelligence

Dheeraj Gundapaneni

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Fraud and Performance Monitoring of Credit Card

Tokenization Using Business Intelligence

by

Dheeraj Gundapaneni

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Abstract

This project major objective is to gather all the necessary data to analyze and deliver a best analytical reporting platform. This product developed for the analysts is expected to extensively use for insights on the token provisioning and its varied utilization with the banks and merchants. Also to monitor fraudulent occurring patterns and initiate necessary steps to avoid facing any adversities in the future.

The reports are generated using the principles supporting descriptive analytics. Using many different KPIs, metrics and scorecards, etc., to support the analysis has given an advantage for better yield. These analytical dashboard has given a deep dive insight for the analysts.

This project has been used by many analysts to come to an agreement on different patterns noticed by each individual. Also for the Senior Executives to get a profound understanding of how the widely different tokenization are used and its different attribute wise segregation.
Acknowledgements

I would like to express my sincere gratitude to my mentors Dr. Ben Baliga, Prof. Gary Nierengarten, and Dr. Hiral Shah for all their support and encouragement throughout my Masters at St. Cloud State University. I sincerely thank Dr. Baliga for his valuable supervision and support for my Capstone project. I am extremely thankful to Dr. Balsy Kasi and Dr. Hiral Shah for having consented to be the committee members of the capstone project and taking time for my Project. I would like to thank parents and family for providing me with all the essentials and encouraging to make my study successful.

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Chapter I: Introduction

Introduction

Payment card industry in today’s digital world needs a secure transactional system for handling frauds and reliable service. Tokenization is one of the algorithmic concepts serving to fight the fraud. Although, after all the sophisticated logical functionality provided a third eye monitoring is always needed for the known fact of security breach still happening. So business intelligence is chosen to analyze the historical breached data and regular skeptical data. The suspicions, evidences are collected to fill in the gaps for enhancing the functionality and adding more security logics (Woody. 2013).

Payment data is strongly secured in the Cyber Source data centers, which are operated by Visa Inc. Usually the token, will preserve the last four digits of the card as a means of accurately matching the token to the payment card, enabling any individual to run their activities without holding card data in the environment. These token data is saved electronically in various forms data warehouse. This token data is inquired using Business Intelligence tools for producing dashboard which dynamically shows the performance till the transaction level by using many types of charts and KPIs.

This project is about producing a dashboard for Visa Inc., which can support analytics carried out to bring undiscovered types of frauds and their factors into light. On a big picture these analytics would serve the firm to reduce many future frauds. These reports will also be used to evaluate or analyze the functioning and progress
of the early discovered frauds and how effectively it is used, with respect to the KPI’s and Scoreboards being created in this Dashboard.

**Problem Statement**

Many payments based industrial organizations like Visa, Master card, Amex, Pay pal, etc., are facing constant risk due to the monetary fund transaction of many individuals is being held. Fraudulent is possible to happen in numerous means, where the combinations can best be discovered and avoided beforehand.

**Nature and Significance of the Problem**

With this Dashboard every analyst can monitor, evaluate and analyze the cause of every fraud occurred and avoided in advance. By conducting analysis against the fraud data and slicing and dicing through the data and types of frauds, special attention can be provided to the monitoring team and respective preventive measures can be taken to avoid any such frauds again.

For the above significant problem the main purposes the dashboard will be serving are:

- Types of tokens and their respective performance in the higher level.
- Determine the possibility of failures of the tokens and possible chances for its improvement.
- Conducting analysis based of various factors like region, business entity, token, etc.
Objective

The main objective of this project is to develop a dashboard to monitor the fraudulent occurring with credit cards to support and provide knowledge towards organizational major concern of data/security breach where in issuers, wallet provider and also the businesses can work with healthy confidence.

Objectives of this project are:

- To create new Issuer and wallet provider facing reports to display Token metrics in Provisioning, Transactional and Operational areas.
- To create aggregated views and scoreboard to monitor by performance level.
- To create new process to deliver report through portals for the organization security group.

Project Questions

The following questions will be answered at the end of the project:

1. How the common entities which support the fraudulent are analyzed and traced?
2. Which tokenization principles are working the best and avoiding fraudulent?
3. How did the historical analysis theories perform to successfully avoid occurring card fraudulent?
4. What are the risk prone factors which always need special attention?
Limitations of the Project

- This project analytics was performed based of only one payment network data which had left the analysts with many undiscovered information.
- This project was a first version of development which has very minimum attributes in the data provided which lacked numerous dimensional slicing and dicing of data presented.
- The project has been provided with limited resources for servers which resulted in a noticeable delayed retrieval of data for analysts.

Definition of Terms

**Business Intelligence:** Business intelligence (BI) is a technology-driven tool/process for analyzing the data and offering dynamic data associated information to assist analysts, corporate executives, business managers and many other end users make more insight for supporting business critical decisions. BI incorporates a variety of tools, applications and methodologies that allow organizations to collect data from internal systems and external sources, prepare it for analysis, develop and run queries against the data, and create reports, dashboards and data visualizations to make the investigated results available to corporate decision makers as well as operational workers.

**Data Ware House:** A data warehouse is an associated data repository for all the saved records that an organizational business enterprise systems gather. The repository can be either physical or logical. Data warehousing emphasizes the data extract from various different sources for useful analysis and access related
purposes, but does not usually begin from the point-of-view of the dashboard user who may need access to specialized, sometimes databases. There are two basic methodologies to data warehousing, top-down and bottom-up. The top-down approach spins off the data marts for specific groups of users after the complete data warehouse has been gathered. The bottom-up approach builds the data marts first and then combines them into a single, all-encompassing data warehouse.

**KPI:** A Key Performance Indicator (KPI) is a measurable value that validates how efficiently an organization is accomplishing key business objectives. Organizations use KPIs to assess their achievements of reaching targets. KPIs differ from organization to organization; examples for business KPIs may be net revenue or a customer loyalty metric, while government organizations might consider measuring unemployment rates.

**BI Dashboard:** A business intelligence dashboard is a data visualization application that exhibits the business defined metrics and key performance indicators (KPIs) for an enterprise. Dashboards are an abstract of multiple associated reports and relative numbers, metrics and sometimes performance scorecards on a single view. It is tailored for a specific role and display metrics targeted for a single point of view or department. The essential structures of a BI dashboard product comprises of customizable interface and also an ability to pull real-time data from multiple sources.

**SQL:** SQL (Structured Query Language) is a special-purpose programming language designed for managing data held in a relational database management
system (RDBMS), or for stream processing in a relational data stream management system (RDSMS).

The query language in 1986 by the American National Standards Institute (ANSI) was made a standard and used to fetch data from the tables in a relational database and to control the table structure and data.

**Data Modeling**: Data modeling is usually the first step in database design and object-oriented programming as the designers/developers first generate a conceptual model of how data items relate to each other. Data modeling encompasses a development from abstract model to logical model to physical data model.

Data modeling is a process designed and analyzed to the data requirement needs to maintain the business processes within the scope of consistent information systems in companies.

**Fact Table**: A data warehousing table that consists of the measurements, metrics or facts of a business process is typically known as a Fact Table. It is positioned at the center of a star schema or a snowflake schema encircled with different descriptive tables. Where multiple fact tables are used, these are organized as a fact constellation schema. A fact table typically has two types of columns: one that contains facts and those that are a foreign key to dimension tables. The primary key of a fact table is usually a composite key that is made up of all of its foreign keys. Fact tables contain the content of the data warehouse and store different types of measures like additive, non-additive, and semi-additive measures.
**Dimensions Table:** A dimension is a structure that classifies facts and measures in order to support users to answer business related queries. Usually organizational dimensions are people, products, place and time. In a data warehouse, dimensions provide structured labeling information to otherwise unordered numeric measures. The dimension is a data set collection of descriptive data elements. The primary functions of dimensions are threefold: to provide filtering, grouping and labeling.

These values are majorly designated for slicing and dicing of data. Slicing refers to filtering data whereas, Dicing refers to grouping data. A common data warehouse example involves sales as the measure, with customer and product as dimensions. For every sale a customer purchases a product. The data can be sliced by eliminating all customers except for a group under study, and then diced by grouping by product.

**Attributes:** Attribute data is qualitative data that can be calculated for extraction and analysis. Examples include the presence or absence of a necessary label, the installation of all necessary fasteners. Attribute data is not a standard production part submission unless variable data cannot be obtained.

**Intelligent Cube:** Intelligent Cubes are In-memory copy of data, which is also known as Multi-Dimensional Cubes (sets of data), that are present on Micro Strategy Intelligent Server memory. The data in Intelligent Cubes can be accessed by different Micro Strategy objects like Reports and Documents.
It allows us to create sets of data that supports multiple reports that can answer variations to similar Business Queries.

There are two types of intelligent cubes in Micro Strategy 9.2:

Personal Intelligence Cubes: In-memory copy of data automatically created in Intelligence Server when a report is executed against the data source. This In-memory copy can provide analytical and OLAP features for report requiring same data as present in personal Intelligence Cubes.

Intelligence Cubes: In-Memory copy of data created by a user using data extracted from the data source, multiple different types of reports can access data present in Intelligent Cube. Intelligent Cube supports OLAP features for reports accessing data in Intelligent Cubes.

**ETL**: Extract, Transform and Load (ETL) denotes to a procedure in database custom and mostly in data warehousing that extracts data from homogeneous or heterogeneous data sources. Transforms data for storing- which is done after applying proper business logics in proper format or configuration for querying and analysis purpose.

ETL states that a process in database convention and particularly in data warehousing are:

- Extracts the data from various homogeneous or heterogeneous data sources
- Transforms the data for storing after applying proper business logic in proper format or configuration for querying and analysis resolution.
- Loads it into the final target (database, more specifically, operational data store, data mart, or data warehouse)

Usually all the three phases execute in parallel since the data extraction takes time, so while the data is being pulled another transformation process executes, processing the already received data and prepares the data for loading and as soon as there is some data ready to be loaded into the target, the data loading kicks off without waiting for the completion of the previous phases.

**Schema:** Extract, Transform and Load (ETL) refers to a process in database usage and especially in data warehousing that:

- Extracts data from homogeneous or heterogeneous data sources.
- Transforms the data for storing it in proper format or structure for querying and analysis purpose.
- Loads it into the final target (database, more specifically, operational data store, data mart, or data warehouse).

In many usual cases all the three phases execute in parallel as the data extraction is a time taking process. So if the data is being extracted, already data extracted transformation process is executed, processing an already transformed data and organizes the data for loading and as soon as there is some data ready to be loaded into the target tables.

**Tokenization:** Tokenization is a process of switching really sensitive data content with a no sensitive data content known as token. Noticeably it will not have any extrinsic or useable sense or assessment. The token is also a reference that
maps back to the sensitive data through a tokenization system. The mapping from original data to a token utilizes different means which extracts the tokens not possible to reverse without the proper tokenization system.

Summary

This chapter gives a brief introduction of the project and also the project questions or motives that is answered or achieved in the later chapters. It also briefs out the basic limitations while implementing. The next chapter also in detail gives the background and literature related to the problems and methodology.
Chapter II: Background and Review of Literature

Introduction

The primary objective of this literature review is to understand the complexities and regularities of the background and prioritize the to-do for the project. Creating an advantage in the development of more specific and significant solution that can directly influence the judgment on choosing evaluation metrics, representations, KPIs and graphs. Considering the requirements and in reference to many scholarly author materials and professionals writings. Also many experienced professional guidance and the historical course study of MEM helped in representing and inscription of the review of literature.

Background Related to the Problem

Business Intelligence (BI) in today’s world is aimed to be more specific to organizational success, goals and stories. They are achieved with multiple software tool combinations aligned and made to become a part of the process. There are many noticeable BI vendors in this competitive data driven analytics world. Of all those best fitting tool for the particular organizational and project needs is to be chosen. In many companies, huge sets of data is gathered and saved for many future necessities. Data collected includes all sorts of Business related Documents, financial data sets, spreadsheets, reports, contracts, and any other business related miscellaneous documents.

Primarily the Business intelligence consideration is only for the supervisory and high level administrators but then as the R&D and product management of the
organization comprehended that the decisions made using the support of BI should not be limited to the higher level individuals but at every possible level of the organization as it helps for organizational growth. BI is not only motivated in similar resolutions, but understanding the insight and trying to avail analysis to all the possible staff. BI captures itself with the structure utilizing data warehousing and online analytical processing (OLAP) techniques. Data warehouse in any organization gathers related data into a Central Data Repository, where it is controlled and administered so it can help the users and organizational groups in the decision-making commitments.

The data extracted from different data sources like data warehouse of the business data are transformed and loaded from the OLTP systems into the schemas where it is available for the Business Intelligence tools to load the data for reporting. A completely cleansed data set is stored in the DWH through a systematically processed ETL system. DWH system has a relational data model that could be created with different levels of data. It is intended to support dimensionality for the graphs and tables to slice and dice the data as intended to show. Business Intelligence system vendors are focused to provide end users with a default SQL query and its own customizable UI to the represent the data. The vendor chosen to support this project was Micro Strategy which fits the best for the requirements of organization and the project.
**Micro strategy.** Micro strategy Business Intelligence software is ideal for tailoring the data into reports or dashboards for analytics. Many companies present worldwide have empowered their business users to easily assist, and analyze all their data and information for astonishing business insights.

Micro Strategy was intended explicitly to help the new age of innovative business intelligence which has an architecture that is gradually unified and specifically considered for the Enterprise, Mobile, or Cloud. All components of Micro Strategy's architecture are the outcome of gradual growth from a lone architectural standard. The integrated BI architectures of other software are not organic but the result of incorporating exclusive BI technologies some of them are many years old (Moraschi, 2013).
Figure 1: Micro Strategy Architecture

**Micro strategy enterprise platform.**

Micro Strategy Intelligence Server: It is the architectural base of the whole software service platform. It acts as the essential communication point for the metadata, Intelligence Server dynamically accumulates the metadata entities to generate improved SQL queries for every major RDBMS, HiveQL queries for Hadoop, and MDX queries for multi-dimensional data sources. It also reclaims the
data, accomplishes any additional analytical calculations not available in the databases, formats the report, and delivers the reports to business users via Micro Strategy Mobile, Web, Office, Desktop, or Distribution Services.

Micro Strategy Web: Micro Strategy web delivers a powerful and user-friendly solution based environment for collaborating the diagnosis analysis through any Web browser. Using progressive web based technologies including HTML, XML, CSS, AJAX, JavaScript, etc., Micro Strategy Web provides a rich user interface with understanding and covering the full range of Micro Strategy functionalities.


Micro Strategy OLAP Services: Micro Strategy OLAP Services is another extension to Intelligence Server that enhances in-memory processing productivity to the typical Relational OLAP functionality of the Micro Strategy Business Intelligence platform. These Services generates and administers Intelligent Cubes, a multi-dimensional cache architecture that ramps up contact to the data which users use very frequently. OLAP Services reveals the report specific measures and elements in the Intelligent Cube so the core analysts can drive the report objects and generate derived measures.
**Micro Strategy Transaction Services:** This is an extension to Intelligence Server that delivers write-back abilities from the Report Services. The principal for this service is in Mobile Apps, and it also works from Web-based DHTML documents. Users who are designated to make changes to the reports and data in the warehouse make optimum utilization of this service when provisioned to do by the admin.

**Micro Strategy Distribution Services:** This is an add-on to Intelligence Server that proactively allocates personalized reports and alerts to the users. In contrast to Micro Strategy Web’s interactive BI environment, Distribution Services distributes interactive Flash dashboards and static reports based on the security assigned to the individuals. This service is the key for security and delivery of the reports.

**Micro Strategy Architect:** Micro Strategy Architect also includes five basic BI applications or analytic modules planned to intensely ramp up the development and deployment of the organizational tailored BI applications. The modules signify horizontal applications collective to most every organization:

- Financial Reporting Analysis
- Human Resources Analysis
- Sales Force Analysis
- Customer Analysis
- Sales and Distribution Analysis

**Micro Strategy Object Manager:** A change management tool that manages the application development lifecycle by evaluating the influence of variations to the
application, and migrating respective changes all through the development, QA, and production environments. This includes the following components:

- Graphical Interface
- Update Packages
- Project Merge

**Micro Strategy Integrity Manager:** This module automates the recognition of discrepancies and issues so that the analysts can trust with highest possible accuracy of the provided data/information. It compares all the dashboards or report, comparing its data, SQL, graph, Excel, PDF output including their execution periods.

**Micro Strategy Enterprise Manager:** This module allows analysis of resource application, applications performance, user statistics, and develops reports to accommodate performance tuning and resource scheduling of the complete Micro Strategy business intelligence application.

**Micro Strategy Command Manager:** This module allows script based governance and administration of dashboards, reports, objects, security, and system structure for large user groups using textual commands. These commands can be compiled in the script files and is run from a graphical user interface, through a command line editor, or directly from the command line.

**Micro Strategy SDK:** This module is a complete development environment mainly used for integration of the Micro Strategy software functionality into other prevailing classifications, particularly enterprise portals, and modifying and prolonging the functionality of the Micro Strategy Web. The Micro Strategy SDK consists of:
- API and platform functionality documentation.
- Development kits supporting portal developments, external application security, and Web based services integration.
- Utilities and code templates help developers in understanding, how the APIs can be used and integrated with the application.

**Literature Related to the Problem**

Payment data in this current digital world is intended to be highly secured in the Cyber Source data centers, which are hosted by Visa Inc. Usually the token, will preserve the last four digits of the card as a resources of precisely matching the token to the payment card, allowing any individual to operate their duties without holding card data in the environment. These token data is protected electronically in various forms in the data warehouse. This token data is inquired using Business Intelligence tools for producing dashboard which animatedly portrays the performance till the transaction level by using many types of graphical representation and KPIs.

This project is about producing a dashboard for Visa, Inc., which can support analytics carried out to bring undiscovered types of frauds and their factors into light. On a big picture these analytics would serve the firm to reduce many future frauds. These reports will also be used to evaluate or analyze the functioning and progress of the early discovered frauds and how effectively it is used, with respect to the KPI's and Scoreboards being created in this Dashboard.
With all technological advancements, tokenization is facing some challenges and disadvantages. Many of them pointed out by the analysts among different organizations, though it has made the processing most secure applications through tokenization. Although tokenization solution means that they must have a way to protect data before it is hacked by possible threats. Furthermore, this project is to build the security and helping consumers with most possible security and having as much clean business as possible.

**Literature Related to the Methodology**

Agile scrum methodology is determined to produce best results based of the working strategies around in the organization. It is an iterative and incremental load agile methodology framework. Scrum is a flexible, holistic development strategy keeping the team focused on their goal.

Scrum has three different roles performing the project operations: Product owner, Team and Scrum master. Product owner is a represent of customer, users or any business owning the product. The major duty of a product owner is to monitor and help the team to achieve the best fitting product. Team is a self-organized group of individuals with the cross functional skills that are responsible for the deliverables and are expected to analyze, design, develop and test. Scrum master is the person with a very good understanding of the scrum development process. Scrum master is expected to be responsible for enforcing rules for the scrum, essential meetings and challenges the team to improve.
Figure 2: Agile Methodology Life Cycle

Scrum includes the cycle of stages Product backlog, Sprint backlog, Daily cycle, Product increment, Sprint review, Sprint retrospective. The product backlog is an ordered list of requirements that is maintained for a product. It comprises of features, bug fixes, non-functional requirements, any necessities for successfully delivery and a viable product. The product backlog items (PBIs) are well-organized by the product owner based on considerations like risk, business value, dependencies, date needed, etc. The sprint backlog is the scheduled queue of tasks for the development team that is to be addressed in the next sprint. The list is a subset from the product backlog items to fill with enough development work until next scheduled sprint meeting. Daily cycle is a process for a meeting scheduled among
the crew every day to discuss any concerns, issues and any updates on the existing iteration. Product increment is an additional increment which is expected to be usable, condition regardless of whether the product owner decides to actually release it. Sprint review is conducted end of every sprint typically an even time frame is decided. No matter how efficient any product is there is always a scope for improvement, Sprint retrospective is point where any improvements are handled and reviewed again. With the above procedure followed any product is expected to give the yield best output.

**Summary**

This chapter discussed about the Micro Strategy implementation for this project with all the advantages listed. It also discusses various phases involved in the agile methodology. It also explains the problem statement and the methodology in depth. In the subsequent chapter, actual methodology, different learnings used for analyzing the data, its design and collection of data and requirements will be explained.
Chapter III: Methodology

Introduction

The intent of this chapter is to describe the process and methodology used in this project. It illustrates the existing business intelligence environment, and what are the resources and how it was designed after which all the changes that were implemented will be discussed in detail. Project timeline and existing BI architecture also be discussed in following sections.

Design of the Study

Typically any Business Intelligence development process is like black holes. It is noticed to take months for the end users to have their analytical requirements generated as reports or dashboards to support user based analytics. At the highest level, common development methodologies such as Scrum and Extreme Programming are being applied to the problem. The basic principle used is the need for an agile, iterative process that minimizes development cycles and speeds time to market for BI requests. There's no reason one can't deliver value to end users in weeks--or even days or hours--rather than months. An agile scrum methodology can fundamentally change how your users recognize the value of BI facilities in a very positive way (Higgins, 2009).

Micro strategy represents a view into the core collective data strength within the enterprise, and as such, managing the master data asset should be considered a critical component of an enterprise information management strategy. Any enterprise creativity that spans the organization is bound to require significant amounts of
energy for coordination: identifying the key stakeholders, gaining their support, harnessing participant collaboration, gathering requirements, and establishing the roles and responsibilities of the right set of people to make the project successful.

Figure 3: SCRUM Process

In other words, as an enterprise initiative, Micro Strategy requires enterprise buy-in and participation. To deploy an enterprise initiative, one must understand who the key stakeholders are within the organization; identify the individuals who will participate in the marketing, education, championing, design, implementation, and ongoing support of the program; and delineate a process for identifying their needs and requirements for the purpose of engineering a high-quality master data asset.
The current project is divided into following phases which are implemented in cycle of stages as follows, which is considered as one sprint:

**Product backlog**: Product backlog in agile scrum methodology is to rank and order to-do task list, comprising a brief descriptions of all the expected functionality in the product. Initially, the whole team, scrum master and the product owner initiate by noting down all the tasks they know and expect in the product which is pending development for project backlog prioritization.

In this project the agile product backlog is mostly the analysts when working on the dashboards or reports come up with a list of requirements which can be of great help for their analytics and they design the report template, look and feel. The product backlog is then endorsed to develop and change as more and more changes are let to evolve about the report and only when the product owner approves the analyst request it is considered to prioritize and developed.

Product backlog consists of:

a. Tasks

b. Bugs

c. Development work

d. Skill achievements
The product management team of the tokenization fraud management project attends all the sprint planning meeting with their own ranked agile product backlog listings and walks through the team the top priority tasks. The team then understands and regulates which tasks they can complete during the coming sprint. The team then moves tasks from the product backlog to the current sprint backlog. Team can always split one task into multiple development tasks and move each Scrum product backlog item into one or more sprint backlog tasks so the team effectively share work in the sprint.

Sprint backlog: The sprint backlog is a list of tasks identified by the development team to be completed during the sprint which for this project was 2 weeks. Throughout the sprint planning meeting, the development team picks the tasks which they are confident in completing in the current sprint from the bucket of
product backlog items. Typically, the tasks created in the backlog were stories including the use cases, and categorizes the tasks whichever is necessary to comprehend every task/story. Teams also estimate number of hours each task will take someone on the team to develop and test it before it is signed off by the product owners.

It was important for the team to select the tasks and volume of the sprint backlog sensibly. As the tasks and stories people committed to completion of the tasks are solely responsible for the completion of the tasks on time. Or had to make sure the message of the delay is delivered to the product management team. The sprint backlog is commonly maintained as a Kanban board. An example of a sprint backlog is on a board with sticky notes on the board example shown in below figure:
Team was expected to update the sprint backlog whenever any new information was available, but nominally once per day. Team always used to do this during the daily morning stand up scrum meeting. The team always did the best to pull the right amount of work into the sprint, but in case of too much or too little work is accepted during the planning. In such cases, the team used to add or remove tasks and notified the product management team accordingly.
**Daily Scrum:** All team members were needed to join the daily morning scrum meetings. Both the Scrum Master and product owner were a dedicated team members and they were also always expected to join and contribute to the scrum. The daily scrum meeting is not purposed to solve any kind of problem or any issue resolution is expected. Any blockers or concerns individuals have were raised but were taken totally offline without disturbing the prime motives of the Scrum after the meeting. Daily scrum questions which each team member is expected to answer are:

1. What did you do on your last working day?
2. What is your today’s plan?
3. Are there any blockers or concerns for the completion of tasks?

**Product increment:** Feedback from all the members of BI team were taken into consideration to identify drawbacks from the current design and discussed about the potential changes that can be implemented to avoid them and also encourage suggestions from the team members to improve the performance.

Product increment is also referred in many cases as Enhancements. In here developer plays a key role in convincing the scrum master and product management team that the requirements cannot be completely delivered but at least with the basic functionality it is delivered might be for any reasons like lack of time, missing details need to be included in the project development. So in such cases the product management or requirement is served with basic needs and left over part will be another task to pick up in later sprints could be next sprint or any other sprint,
depending on the prioritization of the product management team and the availability in case of any missing elements.

**Sprint review**: At the end of every sprint, a sprint review meeting is held. During this meeting, the whole team showcased all their sprint efforts. And also what they completed during the sprint. This used to be a working demo of the developed dashboards or reports. A rough sanity test by the product management team was also conducted at times.

The sprint review meeting was deliberately conducted very informally, which like forbidding the use of any PowerPoint presentation slides and permitting no more than an hours of groundwork time for the meeting. A sprint review meeting would not become any interruption or importantly any diversion for the whole team. Rather, it was a natural outcome of the sprint. Contributors in the sprint review normally comprised the product owner, the Scrum team, the Scrum Master, management, customers from other projects.

During the sprint review, the project was evaluated and compared with the sprint goals defined before the sprint started a while the sprint planning. Ideally, the team always accomplished the sprint goals, and it was always important that the team always accomplish the primary goal of the sprint.

**Sprint retrospective**: In any process there is always a scope and chance for improvement. And the change needs to come from the team. However good the sprint was for the team, we always tried to explore opportunities available to improve. As we strived to be the best Scrum team we always looked for new perfection
opportunities. At the end of each sprint intentionally return on how they are doing and to find ways to recover. This is how our sprint retrospective functioned.

The sprint retrospective was always the last thing of the sprint. The complete team, with both the Scrum Master and the product management team would join. Sprint retrospective ran for up to an hour, which was always enough. However the meetings lasted for an hour. Depending on the interests within the team members to debate or discuss on the topics. Each team members were asked specifically things that the team should:

- Start doing
- Stop doing
- Continue doing

There are many variations for this basic template. The Scrum Master hosts this sprint retrospective meeting by inquiring everyone to speak out the ideas during the retrospective. Have it posted on the To-do’ and the team used vote on the idea they like the most and the idea with the most votes was implemented in the next sprint for process improvements.

**Data Collection**

To achieve business goals, data collection prior, while and after development plays a very important role. Data that are totally related to these objectives has to be properly collected. The major provisions for collecting the data and to attain evolving abnormalities is in the form of excel documents.
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Above, Figures 4 and 5 show the fraud data captures with respect to the transaction and as well the consolidate view. Both the data collected serves the previous graphs to render data and help in users to self-discover fraud related combinations. These data details are gathered while gathering business requirements and are later collected and saved in the data repository in the form of tables as shown above.
Figure 6 shows the data model created from the collected data as per the business requirements technical architecture of data is designed. It is a well-informed data mapping designed to make the dashboard and report works as needed.

**Budget**

All the expenses for this project including the resource compensation, software licensing, physical infrastructure costs, database installation, management costs, maintenance and other miscellaneous costs were covered by the organization.
Timeline

Time line for the complete implementation of this project (Oct 2015) was about 7 months (proposed in February 2015). Total implementation was divided into five different phases.

- Gathering the requirements–1 month
- Collection of Business requirements and planning–2 months
- Developing, Testing, User sign off and refining–2 months
- Deployment of the developed project–1 month
- Evaluation and documentation of the project–1 month

Summary

The intention of this chapter is to explain the process of the project life cycle using Agile SCRUM methodology, its major objectives and functionality for each stage and the basic project context. It also shows the data collection and data modeled schema which best fits this project scope. Also briefs budget and time line facets were discussed.
Chapter IV: Data Presentation and Analysis

Introduction

This chapter illustrates the analysis, presentation and interpretation of the data from this study. To complete this study properly, it is necessary to analyze the data collected in order to test all the factors of fraud occurrences. This section includes the procedures involved in carrying out the study on the collected data for analysis. This is done by making use of various methods of research which is already given in the previous chapters. To complete the process of analysis successfully, the required information was collected from dashboards and reports. Based on the analysis of this data, this project would come with a final conclusion.

Data Presentation

Once the essential data was gathered utilizing different business assets and taking data from different systems a thorough examination of data was performed. Data needed for the study in this venture was additionally gathered from database (Stephen, 2006). The information showed with graphical user interface utilizing distinctive graphs convenient for this study.

Data required for analysis in this study was collected from dashboards and reports. The data used from the dashboard displays are shown below from the graphical user interface used.

**Dashboard display screens:** The below screen shows number of requests received each day for token provisioning of a merchant. It also shows the type of
tokens requested product type like credit cards, debit cards, prepaid cards or deferred cards.

Each wallet provider has a screen to where we can see the token request received along with the product and token type.

Figure 7: Token Provisioning Request Trends

The below screen shows the provisioned cards vs the active token requests received per day. Most of the requests received during each day are for active token compared to provisioned cards.

Now-a-days, mobile or card less transactions are bringing new challenges around fraudulent transactions and a need for merchant to develop new strategies to mitigate the resulting risks (Garvey, 2008). So, providing tokenization services is fundamental need for these transactions. Tokens could be generated at gateway or
by payment networks. As these digital and mobile transactions usage increase, merchant or the issuers face a potential loss of revenue due to fraud.

![Weekly VTS Dashboard](image)

**Figure 8: Provisioned Cards vs Active Tokens**

Regardless of how the payment token is generated, stored, or used, the token must be compatible with the existing payment processing system. To manage the impact on their revenues, issuers forge partnerships with the digital or mobile wallet providers, in order to ensure their cards are supported as mass-adoption of the wallets picks up. More positively, rising usage of mobile/digital wallets also creates opportunities for issuers to send offers direct to customers. Below, Figure 9 shows the statistics of the token volume for the data collected from the issuers.
Figure 9: Token Payment Volume Trends

Below, Figure 10’s bar graph shows the proximity and MST amounts from the major merchants. It also shows the proximity and MST counts for the respective major merchants.
A transaction monitoring report is generated on a daily basis and reported to the financial risk and analysis team to find the root cause of the fraudulent transactions and foresee any potential issue. These reports are generated on a daily basis to help the user identify the necessary filters for preventing the fraudulent transaction. Below are the screenshots of these transaction reports.

**Figure 10: Top 10 Ranked Merchants by Amount and Count**
Figure 11: Fraud Monitoring Report by Transactions

The above bar graph shows the counts to the different types of frauds such as cards reported lost, card reported stolen, issuer reported counterfeit and fraud use of account number.
Figure 12: Fraud Monitoring Report by Merchants

The above graph shows the fraudulent transaction occurred by fraud counts, fraud amounts in USD, fraud amount currency and actual fraud amounts at various merchants.

Data Analysis

This section provides step-by-step analysis on data gathered above. In our study for transaction-based tokens, a different token number is generated for each use of a card and are better suited for small merchants that do not use post authorization data for any purpose other than collecting their money from the day’s transactions. Organizations are bound to comply with this standard whether they’re using tokenization or not.
Figure 13 shows the improved dashboard display of overall display of the tokens requested, tokens provisioned, token status of last seven days. This dashboard also show the provision counts of the top five issuers, sales volume of the top five merchants and provisioned counts by card type. These dashboards are now generated daily instead of weekly to see the last seven days of tokenization trends.

Because tokens do not carry valuable information, such as account numbers and expiration dates, they can be safely stored by online merchants or on mobile devices to enable e-commerce and mobile payments.
Along with these screens, additional dashboards are also created for issuer to review the current token filters and also to foresee the any new issues that could raise a red flag.

Determining the filters to be applied on the data is the most appropriate depends upon the amount of data and their complexity. A flexible fraud monitoring and review system was configured to enables users to select the filters to use and to test strategy before denying payments or pending transactions for review. The two-
step filter process used in this study to effectively monitor existing filter and create new filters or update filter as needed is illustrated below in the diagrams.

Figure 15: Step 1–Transaction Filter Review Process

A transaction is said to be pended when the maximum transaction amount specified by the filter is exceeded. These transactions are waiting for a decision whether to accept or deny the payment. If there are any other filters defined, then those filters will be executed because the payment has neither been accepted nor denied. When there are no more filters to execute and another filter has not caused the payment to be denied or approved, a pended transaction is ready to be reviewed. The following flowchart shows this logic.
Summary

This chapter mainly focuses on how to analyze and interpret the data collected to implement agile methodology to Micro Strategy fraud monitoring system to improve the existing filters in place to reduce the risks. A final summary of the study is provided in the next chapter by elaborating the results of the data analysis. Based
on these results, an attempt has been made to conclude the goals achieved and recommendations for future study in the next sections.
Chapter V: Results, Conclusion, and Recommendations

Introduction

This chapter discusses the results, conclusion and recommendations for the project to help regulating KPIs, scoreboards and reports for evaluating the overall project. It also delivers the answers for the project questions along with the recommendations and potential future work.

Results

1. How the common entities which support the fraud are analyzed and traced?

In the Token provisioning trends report shown in the previous chapters support the analysts with the data representations provided. Users get all levels of trends sectioned by Issuers, Merchants, Product Types and token types. It has data showing the declined transactions and successful transactions. What threats are received for active, inactive, suspended and deactivated cards. This dashboard also represents merchants wise fraudulent transaction reported, which gives analysts the insight of merchant part off security.

The solution needed common entities by merchants, Issuers, Token types, Volumes, Amounts and Authentication. All these entities were served in this dashboard to support the business critical decisions made by the analysts.
2. **Which tokenization principles are working the best and avoiding fraud?**

The reports and Dashboard is provisioned with the filters for users to pick the Tokenization type. Which will narrow down the data set and that would influence all the data representations, KPIs and score cards giving users a clear insight to the depth of the frauds occurring.

Quality Assurance (QA) has played a vital role here in testing the business principles when applied between the sprints. There was huge number of test cases ran to test how the frauds are flagged in the system. This helped in generating new cases and identifying the bugs that are in the reports which were ignoring the flags or letting the fraudulent escape from the business logic layer applied in the reports.

This has facilitated users in aligning and understanding the reports and dashboards for users. Different tokenization like ANSI X9, PCI and Visa tokenization are noticeably the best fraud protective tokenization. With having Visa tokenization in house it is flexible enough to customize the security over ride. There has always been a scope of improvement and always allowing analysts exposed to any possible new threats through these reports.

3. **How did the historical analysis theories perform to successfully avoid occurring card fraudulent?**
Business Intelligence has always relied on the historical data representation. The trend mostly explains and helps in discovering half of the fraud causing issues straightaway. Historical data analysis has always been a back bone for many analytics theories derived till date.

And it also played a vital role in delivering this project with rich analytics to the analysts and any other users. In these reports historical trends and flagged fraud combination are always used as reference to the analysts which helps them wasting analysts their time assuming it to be a new kind of fraud.

In most use cases noticed, it was always analysts using historical data for comparison of the fraud kind and comparing the resolutions productivity. With this kind of comparative analytics users have noticed many resolved fraud techniques are brought back with very minor changes and the resolution for such would obviously be easy for users.

4. **What are the risk prone factors which always need special attention?**

The factors here are delivered in the project as a form of KPI and flags, which in later stages is converted to filters for users. This is where the analysts were provided with write-back functionalities. This write back functionality is used to insert data into the DWH and left with all the combination of keys for any analyst’s future reference. Which gives the users doing analysis the next business day to notice the flags and filter through making their life easy not struggling to similar kind of analysis.
Any flag which is colored red as it needs special attention of analysts till the combination of the fraud causing factors are learned. This will typically stay for 30 days red in color. Later it is converted to the default black in color, as the fraud type gets old it is believed analysts learned about the kind of fraud. There is another flag purple coloring convention is used saying it is very prominent in today’s fraud type. Once the fraud type is not much found, it is again changed dynamically to the default black color.

Conclusion

Fraudulent has been a huge threat for many organizations, of which credit cards has been a great threat. Payment data is sturdily protected in the Cyber Source data centers, which are operated by Visa Inc. Typically the token, will reserve the last four digits of the card as a means of precisely matching the token to the payment card, enabling any individual to run their activities without holding card data in the environment.

These token data is protected electronically in various forms data warehouse. This token data is requested using Business Intelligence tools for generating dashboards which animatedly displays the performance till the transaction level by using many types of graphs, scorecards and KPIs.

Micro strategy leveraged the token data that are stored in the data bases to analyze the fraud patterns and behavior for different types of merchants and by token types. This analysis has a great potential in discovering the fraud patterns and also which type of secure data transfer is performing the best. The analysis can be
extended to discover potential threats and any kind of possible frauds way ahead even before occurring. These reports and dashboards provide a comprehensive risk management solution to the business which assists them to take precise and timely conclusions towards better secured service.

**Recommendations**

- If the organization can extend the analytics to many other competitor organizations, more combinations could be recorded. It can be of mutual organizational benefits.

- This project can always add many more attributes like the time of purchases and seeing the location from where the fraud orders were processed from, etc.

- This project was provided with very limited infrastructure and is limited to only few analysts in the organization. If the infrastructure could be expanded including the licenses, many more analysts can dive in and perform analytics.
Reference


