

A Near-Field Communication-Enabled Loyalty Program with Marketing Analytics

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ABSTRACT

This study aims to design and implement a Near-Field Communication (NFC) Loyalty Program integrated with Marketing Analytics to address the inefficiencies of traditional customer loyalty systems in the retail industry. The problem identified was the lack of automation, real-time tracking, and actionable insights in current loyalty programs, which limits understanding of customer purchase behavior. Using a developmental research approach, the study involved system development using NFC technology for customer transactions implemented on a Raffle System. Evaluation was conducted through system testing and end-user feedback from retail employees and customers. Results demonstrated improved loyalty scoring and ranking, data-driven marketing decisions, and opportunities to increase customer satisfaction. The system's analytics dashboard provided real-time insights into purchasing patterns, helping retailers tailor promotional strategies. The study concludes that NFC-based loyalty programs enhance operational efficiency and customer engagement. It recommends broader implementation in the retail sector, along with future improvements in system scalability and user experience design.

Keywords: near-field communication, loyalty program, raffle system, marketing analytics, customer purchasing behavior

INTRODUCTION

The Problem and Its Setting

Near-Field Communication (NFC) technology has gained significant attention in recent years due to its versatility and ease of use. NFC enables data exchange between devices in a contactless manner, making it ideal for various applications. Being a short-range wireless communication technology, it allows two devices to exchange data when they are in close proximity. Its applications span across multiple industries, including mobile payments, transportation, healthcare, and retail in worldwide setup. According to Huang, Zhang (2021), it has transformed the retail industry by enabling contactless payments and enhancing customer engagement. NFC faces the challenge to limited infrastructure and consumer acceptance in the global state even if it is flourishing in the industries. The open-mindedness of the consumers is still a factor in the large-scale use of the said technology. With continued innovation and collaboration, NFC has the potential to further revolutionize how people interact with technology and conduct everyday transactions worldwide.

The Philippines has experienced significant advancements in technology adoption, making it an ideal context to study the implementation of NFC technology. It has been present already in the transportation sector of the government as a means to pay and access to ride MRTs with the use of BEEP cards that are NFC-enabled Blancaflor et al. (2024). Though it is not still visible in the retail industry as most technology used in it is still of magnetic stripes cards. Despite the promising potential, NFC technology in the Philippines faces challenges that hinder its widespread adoption. There are obstacles related to infrastructure, consumer awareness, security concerns, and interoperability that need to be addressed for NFC's successful integration. NFC loyalty has not been widely accepted due to the following reasons; minimal to low NFC terminal penetration and device ownership, QR code payment and loyalty representation preference on banks, digital and traditional, and consumer skepticism on other newly emerging technologies like NFC (Acosta et al., 2023). This provides the

researcher the opportunity to prove the flexibility and importance of NFC tied up with marketing analytics specifically in the retail industry.

Marketing Analytics is one of the technologies that focuses on the marketing profile of customers and their behavior. It is said that a shopper's behavior is affected by culture and economic status (Gilboa, 2020). In order to properly capture this, marketing analytics plays its role to understand how this behavior and profiles will help understand the growth of the mall in terms of revenue and sales. In order to fully make use of the technology, gaining insights about mall shopping behavior through profiling different types of shoppers are required (Gilboa, 2020).

Locally, the retail industry specifically the malls are more focused on driving customer loyalty with the use of their magnetic strip cards instead of NFC. These magnetic stripe cards tend to deteriorate over time as more transactions are done. It has been seen that as of 2023, along with the influence of the Generation Z, consumers have preferred cashless transactions, specifically NFC technology, which gave a 70% increase in the tap-to-pay preference transactions, compared to 37% in 2022, while cash transactions dipped at 87% versus 2022 at 96% (Visa, 2024). Generation Z as more enticed and inclined with the use of newer technologies like NFC which tied them up to be more loyal and interested with products or services that allows them to maximize their savviness and efficiency on the use of NFC and other technologies Alt & Agárdi (2023). There are also no existing malls that uses NFC technology to handle their rewards and loyalty program.

Seeing the opportunities to improve the rewards and loyalty system, the researcher suggests in coming up with an enhanced version of the existing rewards and loyalty system available in the retail industry. It is a system that comes up with a measurement of the customer loyalty according to recency, frequency and monetary value of purchases to address the one-dimension basis for loyalty which is monetary. The researcher believes that these three variables will create a more impactful result in measuring customer loyalty as discussed by Chen, Huang, Liu (2020). The system provides gathering of customer profiles including their purchasing activity which can be used by the mall management to understand the stores that are excelling and those that needs help for promotion and advertising. It will provide analytics reports as a summary of the findings done from data gathering with the use of the NFC-enabled membership cards replacing the magnetic stripe membership cards as consumers have been more open to the use of contactless transactions (Visa, 2022).

The Raffle System will be adapted to best capture the customer's shopping behavior and demography and fully maximize the capabilities of the marketing analytics that can be drawn from the data gathered from the said raffle promo event and assess the loyalty and rewards system proposed. As supported with the study of Calimag et al. (2020) that raffle-based promotions can reliably generate behavioral data, particularly sales response and preference trends, and are a practical method for researchers to gather structured insights on purchase behavior in real-world retail. Thus, these gaps identified in the existing loyalty program and marketing analytics reports generation provided a drive to the researcher to conduct the study, develop and implement the system in his field of profession.

LITERATURE REVIEW

The literature review presents the related literatures and studies that has a relation to the study. This also defines and explains the important terminologies present in the study.

Near-Field Communication (NFC)

Near-Field Communication (NFC) is a short-range wireless communication technology that enables convenient and secure data exchange between devices. NFC has gained significant attention in various domains, including mobile payment systems, access control, transportation, and healthcare.

NFC technology has evolved from Radio Frequency Identification (RFID) and Contactless Smart Card (CSC) technologies. It combines the capabilities of both technologies, offering a seamless and intuitive interaction between devices. According to Toftegaard et al. (2014), NFC has its roots in RFID technology, but it provides enhanced security and interactivity, making it suitable for various applications.

One of the most prominent applications of NFC is in mobile payment systems. Kim et al. (2018) discussed the adoption of NFC-based mobile payment platforms, such as Apple Pay and Google Wallet, which have revolutionized the way individuals make payments. They highlight the convenience and security features of NFC in enabling contactless payments, enhancing user experience, and reducing transaction times.

NFC has also found applications in access control and identification systems. It explores the use of NFC in electronic passports, smart cards, and building access control. The author discusses how NFC technology provides improved security, user-friendliness, and interoperability compared to traditional identification methods.

Transportation systems have benefited from the implementation of NFC technology. Santucci et al. (2016) present a case study on NFC-based ticketing systems in public transportation, highlighting the advantages of NFC in terms of ease of use, interoperability, and real-time information updates. They discuss the impact of NFC technology on reducing ticketing costs and enhancing user satisfaction.

In the healthcare domain, NFC has the potential to improve patient care and safety. Palumbo et al. (2015) discuss the use of NFC for medication management, patient identification, and remote monitoring. They emphasize the benefits of NFC in enhancing medication adherence, reducing errors, and enabling efficient healthcare delivery.

While NFC technology offers numerous advantages, it also presents several challenges that need to be addressed. Chandrasekaran et al. (2017) identify security and privacy concerns, lack of standardization, and limited compatibility with older devices as key challenges associated with NFC implementation. They propose solutions and future research directions to overcome these challenges, including the development of secure protocols, standardized frameworks, and improved interoperability.

NFC technology has emerged as a versatile solution for secure and convenient data exchange between devices. This literature review highlighted the evolution of NFC, explored its applications in various domains, and discussed the challenges associated with its implementation. As research in NFC continues to evolve, addressing security concerns, standardization issues, and compatibility limitations will be crucial for its widespread adoption and seamless integration into everyday life.

Marketing Analytics

Marketing analytics refers to the practice of measuring, managing, and analyzing marketing data to improve decision-making, enhance marketing effectiveness, and drive business growth. It plays a crucial role in CRM by providing insights into customer behavior and preferences. Verhoef et al. (2020) discuss the application of marketing analytics in CRM, highlighting its impact on customer segmentation, targeting, and personalization. They emphasize the use of advanced analytics techniques, such as machine learning and predictive modeling, to enhance customer relationship management.

Marketing analytics has become essential in the context of digital marketing and social media. Kumar et al. (2019) examined the use of marketing analytics to measure and optimize digital marketing campaigns. They discuss the integration of analytics tools, such as web analytics and social media analytics, to track customer interactions, campaign performance, and social media engagement.

Analytics has also been applied to pricing and revenue management strategies. Chen and Huang (2018) investigate the use of marketing analytics to optimize pricing decisions. They discuss the application of price optimization models and data-driven approaches to analyze customer demand, competitive pricing, and revenue management.

Predictive analytics is widely used in marketing to forecast customer behavior and outcomes. Verhoef et al. (2019) explore the application of predictive analytics in marketing, emphasizing the use of machine learning algorithms and data mining techniques to predict customer churn, customer lifetime value, and response to marketing campaigns.

Customer segmentation and targeting are fundamental components of marketing analytics. Kumar et al. (2021) discussed the use of segmentation techniques, such as clustering and latent class analysis, to identify distinct customer segments based on their characteristics and behaviors. They highlight the importance of targeted marketing strategies tailored to specific customer segments.

Marketing analytics has a significant impact on marketing performance and effectiveness. Breugelmans et al. (2020) examine the relationship between marketing analytics and firm performance. They find that firms that effectively leverage marketing analytics outperform their competitors in terms of sales growth, customer acquisition, and profitability.

Marketing analytics contributes to enhancing the customer experience and satisfaction. Ngai et al. (2021) investigate the role of marketing analytics in improving customer experience management. They highlight the use of analytics-driven insights to personalize customer interactions, provide tailored recommendations, and enhance overall customer satisfaction.

Marketing analytics has emerged as a critical discipline for businesses seeking to improve marketing effectiveness, customer relationships, and overall business outcomes. This literature review highlighted recent research on marketing analytics, focusing on its applications in CRM, digital marketing, pricing, and revenue management. It also discussed the methodologies employed in marketing analytics, such as predictive analytics and customer segmentation.

Rewards Point System

Rewards point systems are prevalent marketing tools used by businesses to incentivize customer loyalty and encourage repeat purchases. Recent studies have shown that rewards point systems positively influence customer loyalty and retention. Lu, Pan, and Zeng (2018) investigated the impact of a loyalty program on customer retention in the retail industry. They found that customers enrolled in the rewards program were more likely to continue shopping with the brand and had a higher customer lifetime value.

Several studies have examined the effect of rewards point systems on customers' purchase behavior and frequency. Shahzad, Sharif, and Gulzar (2018) explored the relationship between loyalty program membership and customer spending in the context of the airline industry. They reported that customers enrolled in the airline's rewards program had higher spending levels and a greater number of flight bookings.

Rewards point systems have been shown to enhance customer engagement and satisfaction. Ha and Jang (2018) studied the impact of a rewards program on customer engagement in the restaurant industry. They found that customers participating in the loyalty program were more engaged with the brand, resulting in higher levels of satisfaction and advocacy.

Recent research has emphasized the importance of program design and personalization in rewards point systems. Alnasser, Albaity, and Hussainey (2020) investigated the impact of program design elements, such as point expiration policies and reward variety, on customer perceptions. They found that a well-designed and personalized program led to higher customer satisfaction and increased redemption rates.

With the growing importance of digital channels, incorporating rewards point systems into mobile apps has become crucial. Park and Lee (2020) examined the effectiveness of mobile app-based rewards programs in the retail industry. They found that mobile app-based rewards significantly influenced customer loyalty and increased the usage of the app for shopping.

Segmenting customers based on their preferences and behaviors is essential for effective rewards point systems. Narwal and Kumar (2019) investigated the impact of customer segmentation on program effectiveness in the hospitality industry. They found that targeted rewards and offers based on customer segments improved program performance and customer satisfaction.

Rewards point systems continue to be valuable tools for fostering customer loyalty, increasing engagement, and driving repeat purchases. This literature review highlighted recent research that supports the benefits of

rewards point systems on customer loyalty, engagement, and satisfaction. Furthermore, the review identified program design, personalization, digital transformation, mobile apps, and customer segmentation as critical factors for optimizing the effectiveness of rewards point systems.

Recency, Frequency, Monetary Value (RFM) Analysis Technique

Chen, Huang, Liu (2020) defines Recency, Frequency, and Monetary value (RFM) as an analysis technique that categorizes customers into distinct segments based on their purchasing behavior. It highlights its applications across industries, advancements in methodology, and its effectiveness in predicting customer behavior and optimizing marketing strategies. It underscores the continuing relevance and evolution of the RFM analysis technique as a valuable tool for customer segmentation and targeted marketing efforts.

K-Means Algorithm

The K-means algorithm is a popular clustering technique used for data segmentation and pattern recognition. It aims to partition a dataset into K distinct clusters based on the similarity of data points. It has found significant applications in image and video processing. Zhang et al. (2018) propose a K-means-based image segmentation method that considers both color and texture features. Their approach achieves accurate segmentation results in various image datasets, demonstrating its effectiveness in image analysis and understanding.

K-means clustering is widely used in customer segmentation and targeting for marketing purposes. Chaudhuri and Majumder (2019) explore the application of K-means clustering in customer segmentation for personalized marketing campaigns. Their study demonstrates how K-means clustering helps identify distinct customer segments based on their purchasing behavior, preferences, and demographics.

K-means segmentation has been applied to healthcare and medical data analysis. Dey et al. (2020) propose a K-means-based approach for clustering electroencephalogram (EEG) signals to detect anomalies. Their study demonstrates the potential of K-means clustering in identifying abnormal EEG patterns and assisting in medical diagnosis.

Recent research has focused on improving the scalability and efficiency of the K-means algorithm. Zhao et al. (2019) propose an accelerated K-means clustering algorithm that incorporates parallel processing techniques. Their approach significantly reduces the computational time required for large-scale datasets, enabling efficient clustering in real-time applications.

Moreover, hybrid and enhanced versions of the K-means algorithm have been developed to improve clustering accuracy and robustness. Li et al. (2021) introduced a hybrid K-means clustering algorithm that combines K-means with fuzzy clustering. Their approach achieves better results in terms of cluster quality and noise handling, particularly in datasets with overlapping clusters.

The K-means segmentation algorithm remains a widely used technique for data clustering and segmentation in various domains. This literature review highlighted recent research on K-means clustering, focusing on its applications in image and video processing, customer segmentation, and healthcare data analysis. Additionally, the review discussed variations and performance improvements, including scalability and efficiency enhancements, hybrid algorithms, and the impact of different distance metrics. As research continues, further advancements in algorithmic techniques and applications are expected to enhance the effectiveness and applicability of the K-means segmentation algorithm.

Net Promoter Score (NPS) Metric

According to Charalambides, et al (2019), Net Promoter Score (NPS) is a widely adopted customer loyalty and satisfaction measurement tool that quantifies customer advocacy and loyalty by categorizing customers into promoters, passives, and detractors. NPS is applied across industries, methodological advancements, and its effectiveness in predicting business performance and driving customer-centric strategies.

SM Advantage Card (SMAC)

The SM Advantage Card is a loyalty program introduced by SM Prime Holdings, one of the largest retail conglomerates in the Philippines. Customer loyalty programs are widely adopted by retailers to build long-term relationships with their customers. The SM Advantage Card, launched in 2002, offers exclusive benefits to cardholders, such as earning points for purchases made at SM-affiliated establishments and redeeming those points for discounts or free items. The program has garnered significant attention and loyalty among Filipino consumers.

The SM Advantage Card offers a range of benefits to its cardholders, aiming to enhance their shopping experience and foster loyalty. These benefits may include exclusive discounts, personalized offers, and access to special promotions. Cardholders perceive the SM Advantage Card as valuable due to the savings and convenience it provides (Rivera & Javier, 2017).

Various studies have examined the impact of loyalty programs, including the SM Advantage Card, on customer loyalty. Loyalty programs, when effectively implemented, have been found to positively influence customer behavior and increase their likelihood of repurchasing (Han et al., 2019). The SM Advantage Card, with its rewards and personalized offers, aims to strengthen customer loyalty by providing incentives for repeat purchases and fostering a sense of exclusivity.

The SM Advantage Card has significant implications for the retail industry in the Philippines. It has not only encouraged customer loyalty towards the SM brand but also shaped consumer behavior and preferences. By leveraging customer data collected through the card program, SM Prime Holdings can gain insights into customer preferences, which can inform marketing strategies and enhance customer satisfaction.

The SM Advantage Card has emerged as a successful customer loyalty program in the retail industry. Its benefits, such as exclusive discounts and personalized offers, have been perceived positively by cardholders. Loyalty programs like the SM Advantage Card play a crucial role in strengthening customer loyalty and influencing purchasing behavior. Further research is needed to explore the long-term effects of the SM Advantage Card and its evolving role in the retail landscape.

The Benefits of Near-Field Communication for Retail Businesses

Near-Field Communication has become a famous tool that reach the top in empowering businesses with excellence in insights and transform customer experience. According to Chokshi (2019), research predicts that NFC and other contactless payment technologies will generate roughly \$190 billion in sales in the US. This has been an in-demand use already in the industry.

Some of the benefits of the use of NFC includes streamlined payments. It has been considered as a highly secure payment option. This has also been adopted by the three biggest giant techs, Samsung, Apple and Google, as a mode of payment. With this, it has showed customer approval and satisfaction with NFC. It also provides better customer experience in terms of retailers encouraging customers to visit their stores now that online shopping is a fad. With mobile phones being NFC-enabled, it has allowed the customer to experience the scanning of products with NFC tags. It makes their shopping experience a more straightforward and engaging experience. Finally, it allows enhanced loyalty where customers are able to enhance their loyalty program experience by participating with the use of their NFC-enabled smart phones. Just by a single tap, they can start racking up loyalty points immediately.

Benefits of Offering NFC Loyalty ID

According to Hendrix (2019), technology continues to change the relationship between guests and their favorite brands. Today, one-click ordering, cashless payments, and subscriptions deliver frictionless purchase experiences. To meet rising expectations, restaurants and c-stores must provide guests with easy and hassle-free checkout, and a great way to accomplish this is with NFC Loyalty ID.

NFC enables two devices to exchange data when they are brought into close proximity of each other. By

simply tapping their phones at an NFC-enabled payment terminal, guests complete their purchase without having to dig through their purses or wallets to find a means of payment and passes along their identification for the brand's guest engagement program. If they are not members already, the device will display a message inviting them to join the program.

The five biggest benefits of integrating NFC Loyalty ID into service offerings includes improved line speed where you are able to transmit data and complete a transaction with just one tap reduces waiting time at the register. In addition to benefiting your busy guests, it makes transactions quicker and smoother for the cashier. It also heightens data security and quality where with NFC payment, sensitive credit card data is stored by the mobile wallet providers, but not by the restaurant or c-store. Guests can feel confident when paying with mobile wallets since they are more secure than swiping. It also gains insight into guest behavior by knowing the visit times, locations, and transaction details for each guest enables brands to send targeted communications and offers. It also engages younger demographic where those who use Apple Pay and Google Pay are typically about five years younger than a brand's average guest. Also, enjoy higher check averages where guests are earning visit credit via mobile payment with NFC Loyalty ID, they tend to spend more.

NFC Loyalty ID represents the intersection of convenient payment and guest engagement. Through innovative technology, retailers can provide frictionless guest experiences while at the same time capturing data and offering easy enrollment in a loyalty program.

Mall Raffle System

Raffle systems are a type of promotional activity where participants receive entries—often through purchases—with the potential to win prizes. These systems are commonly used in malls to encourage customer engagement, increase foot traffic, and boost sales during key promotional periods such as holidays and anniversaries. According to Kotler and Keller (2016), promotional tools like raffles form a part of the sales promotion mix that delivers short-term incentives to encourage purchase or sale of a product or service. These campaigns aim to directly influence buyer behavior and enhance customer loyalty.

Traditionally, raffle entries were paper-based and manually collected. However, the evolution of digital systems has transformed raffle systems into more efficient and secure platforms. Digital raffle systems minimize fraud, reduce manual labor, and allow for real-time data analytics and tracking. A study by Singh and Pandey (2020) emphasized the importance of digital transformation in customer interaction systems, including automated raffle systems, stating that it enhances data accuracy, customer reach, and user satisfaction.

Mall operators use raffle systems to achieve several goals like Increased sales volume: Customers tend to increase their spending to gain more entries; Customer retention and engagement: Raffle systems often require user registration, enabling CRM (Customer Relationship Management) initiative and; Marketing analytics: Data gathered from entries help analyze customer demographics and spending patterns. Lovelock and Wirtz (2016) point out that promotional tools like raffles are particularly effective in-service environments such as malls where differentiation is achieved through experiences and emotional engagement.

Mall raffle systems have evolved from simple manual processes to complex, integrated digital systems that offer numerous advantages in marketing, customer engagement, and data collection. However, careful attention must be given to design, security, user experience, and compliance to ensure their effectiveness and acceptance.

Conceptual Framework

The conceptual framework presents the overview of the study from conception to delivery. It starts with the gathering of customer's information, purchase history, frequency, recency and monetary value of the purchase done by the customer on a store of the mall. The said gathered information are processed using the Agile Method where it includes the formulation of algorithm and coming up with the expected system. Interview Guide is used to gather needed information about marketing analytics, statistics and result which will support

the study. UAT questionnaires are the means to evaluate the results of the developed system according to identified indicators. It is expected that undergoing the said process will come up with the Near-Field Communication Loyalty Program with Marketing Analytics along with the necessary reports that the system will provide.

INPUT	PROCESS	OUTPUT
Loyalty Program	UAT Questionnaire	Developing Near-Field Communication (NFC) Loyalty Program with Marketing Analytics
Marketing Analytics and Customer Rewards Scheme	Interview	
	Algorithm Formulation (K-Means, RFM Score, NPS)	
	Software Model (Agile Methodology)	

Figure 1. Conceptual Framework

As shown on Figure 1, the Conceptual Framework presents the coverage of Input, Process and Output expected in the study.

Statement of the Problem

The general objective of the study is to develop a Near-Field Communication Loyalty Program with Marketing Analytics.

Specifically, the study answered the following:

1. What are the different marketing analytics and customer rewards schemes used in the retail industry?
2. What are the problems and issues of the existing Loyalty Program?
3. What are the content and features of Near-Field Communication Loyalty Program with Marketing Analytics?
4. What is the level of efficiency of Near-Field Communication Loyalty Program with Marketing Analytics in terms of:
 - 4.1. Response Time
 - 4.2. Competency
 - 4.3. Reports Generation
5. What is the level of the user acceptance of Near-Field Communication Loyalty Program with Marketing Analytics in terms of the following:
 - 5.1. Usability
 - 5.2. Functionality

Scope and Delimitation

NFC Loyalty Program with Marketing Analytics enjoins the participation on the study of mall employees, specifically the Operations, Leasing and Marketing Department, and the customers of SM City General Santos, Lagao, General Santos City activated on one of the mall marketing events called Shop and Win that runs from

September 15, 2023 to November 18, 2023. The datasets gathered from respondents will be the basis for the unbiased and justifiable interpretation of the customer loyalty (Chen, et al, 2020).

Significance of the Study

The researcher having thorough gathering of initial data and statistics on the possibility of improving the Loyalty System on retail industries, it has been found that there is a gap in how Loyalty System is implemented in our business industry, specifically in General Santos. There are no existing studies that delved into the marketing aspect of the business to gauge the loyalty metrics of consumers thus, the researcher concluded and saw this as an opportunity to improve and provide efficient and accurate Near-Field Communication Loyalty Program with Marketing Analytics in the locale of study.

Thus, the study aims to aid the different sectors and industry in improving their shopping experience.

Customers. They are provided with a new experience using their loyalty system that offers wide variety of discounts and promos thus maintaining their loyalty to shop, dine and enjoy on the stores they patronize in the mall.

Store owners. They are ensured that their products were continually patronized and purchased based on the suggestions and improvements findings which, the study provided supported by the Operations and Marketing Team of the mall.

Marketing Team. They can come up with marketing analytics reports and forecasts that efficiently allows them to identify stores that needs advertising and promotion.

Operations Team. They may identify the top stores of the mall that are both earning and losing that enable them to come up with a contingency plan on how to help these stores in improving their customer experience and sales.

The researcher. The study provides an opportunity to expand his knowledge on how marketing analytics works in the retail industry. It helped the researcher in understanding and translating the needs of the business into a working system which benefitted the company.

Future Researchers. Future Researchers can adapt the study as a reference to their related literature including the concept of improving the study by providing enhancements that are not yet presented in this paper.

METHODOLOGY

This chapter presents the methods and procedures used in the study. It includes the design of the research, how the respondents are selected, the research instruments used and how it was used, data gathering procedures done, software model adapted, how the data are analyzed and treated and the ethical considerations.

Research Design

The study uses a quantitative research design. Creswell and Creswell (2017) stated that quantitative research is a systematic collection, analysis, and interpretation of numerical data to study phenomena and make informed conclusions. It measures the level of the acceptability of the system based on two indicators, which are the usability and functionality. This will thoroughly look into the data gathered to assess its significance to the study. Once all the necessary data are measured and analyzed, a conclusion is drawn to whether the study achieved its objectives.

Selection of Respondents

The study uses the Convenience Sampling Technique in the selection of the respondents. According to Alex (2024), convenience sampling is a non probability sampling method where researchers select participants due to their availability and accessibility, rather than via random or systematic procedures. Researchers often use

convenience sampling when time, budget, or access constraints make probability sampling impractical. It allows rapid collection of preliminary data in settings where a comprehensive sampling frame is unavailable.

The respondents are divided into two research instruments used, UAT Questionnaire and Interview Guide. The mall shoppers provide validated and substantial findings to measure the effectivity of the system developed for the study in handling the customer purchasing data translated to loyalty through raffle promo participation where raw data set are used to test and validate the effectivity of the loyalty scoring and marketing analytics of the system. The said 112 customers, 96% of the population, who voluntarily participated in the study were provided with UAT Questionnaires. On the other hand, five representatives, 4% of the population, from each of the following departments, Operations, Leasing and Marketing purposively sampled for distribution and completion of the interview guide to assess the comparative data for the existing and proposed system. The 117 total sample of respondents, 8% of the total population, that participated in the User Acceptance Testing, both from mall customers and mall employees which, is drawn from 1410 mall customers who participated in the raffle redemption as the considered population.

Research Instruments

The study uses two types of research instruments, which are the Interview Questionnaire and the User Acceptance Test (UAT) Questionnaires for the mall shoppers. The interview contains five questions that addressed the queries on the experience with the Loyalty Program proposed by the study for both mall employees and customers. This aids the researcher in identifying a comparative result on the existing and proposed loyalty program. The UAT questionnaire, contains 16 questions categorized according to the usability and functionality of the system. This aims to see how efficient the system is in terms of generating marketing analytics based on the data gathered through the rewards and loyalty system used. This, also, aims to assess whether the system is acceptable as store front application in gathering customer information through the rewards and loyalty program. Finally, it also aims in exploring the experience of the customer in interacting with the system using the rewards and loyalty program that they are a part of.

Data Gathering Procedures

The research procedure is divided into two phases: the data gathering procedure and the software model used in the study.

Phase I – Data Gathering Procedure

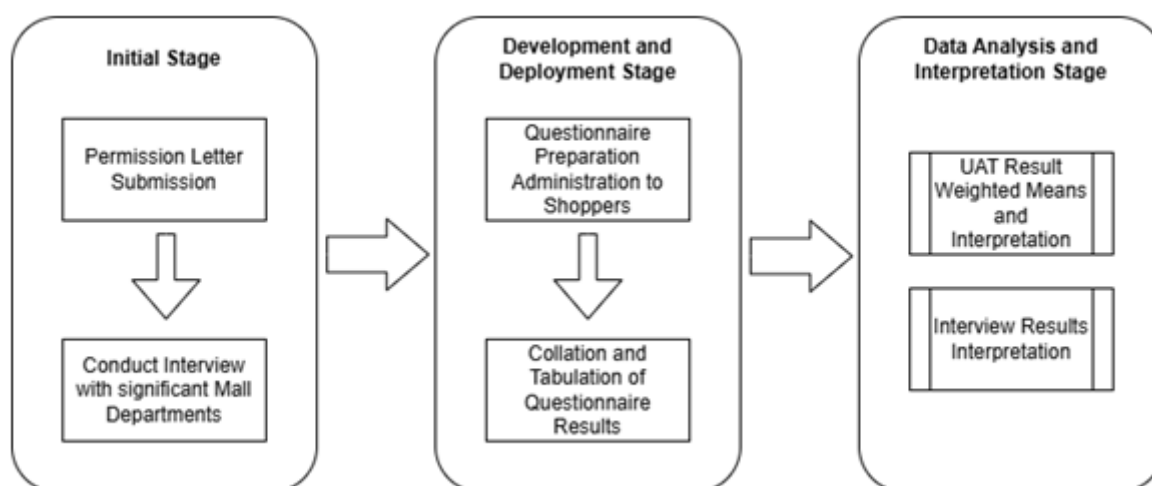


Figure 2. Step-by-Step Data Gathering Procedure

As indicated in Figure 2 above, data gathering procedure of the study includes the following:

Submission of Permission Letter to Conduct Study. A permission letter addressed to the Mall Manager is drafted and submitted for the gathering of the data to commence. It indicates the two types of research

instruments: Interview and Questionnaire, that were conducted to mall shoppers.

Conduct Interview. With the approval of the permission letter, the researcher starts to coordinate with concerned departments, Operations, Marketing and Leasing, in implementing the study and deployment of the system for the raffle promo.

Preparation and Administration of Questionnaires. It took place after the system was fully developed and tested. Mall Shoppers voluntarily fills up the questionnaire according to their purchasing experience using the developed system and rewards and loyalty system. Prior to the answering of the questionnaire, the respondents were oriented of each category and questions so they fully understood the context of the study. They were also encouraged to answer the questionnaire truthfully and honestly so as to ensure the genuinely received feedbacks which, truly justified the outcome of the study.

Collation and Tabulation of Data. The responded questionnaires were collated and tabulated on a spreadsheet in preparation for the analysis of the results. On the other hand, the interview results are collected were transcribed in order to fully understood the thoughts of the interviewees.

Analysis and Interpretation. The researcher used the Weighted Means Interpretation of UAT Scale in analyzing and interpreting the result of the questionnaire. While the transcribed interview result was used as a reference in evaluating the system and answering the common questions that revolves around the marketing statistics, the results were derived from rewards and loyalty program.

Phase II – Software Model



Figure 3. Agile Software Model (Laoyan, 2022)

The study uses the Agile Model as indicate in Figure 3 above. Laoyan (2022) said that Agile Method is an iterative methodology. Ambler and Lines (2019) stated that the Agile Model is an approach that prioritizes flexibility, collaboration, and iterative development. It is characterized by adaptive planning, continuous feedback, and delivering working software in short, incremental iterations. Agile methodologies emphasize customer satisfaction, responding to change, and self-organizing teams. The system is comprised of three technologies including Human-Computer Interaction (HCI) with the use of NFC, cloud computing for hosting the system and marketing analytics that will provide statistics, forecasting and reports. In addition to this, algorithms such as the K-means clustering is used to provide a wider scope and requirements in developing the

said system. It provided an opportunity for Agile Method to be used in order to see the progress of the system into fruition. The Agile Method was helpful in producing a working system at an early stage and improve it through a series of iterations.

The development of the system ran through each phase of the Agile Model:

Phase 1: Plan. This phase is focused on the gathering of necessary data needed for the development of the system. Informal interview with mall employees will take place in gathering information on the system to be developed. This information includes, and not limited to, marketing techniques and data needed to come up with a statistic of the customer's purchasing power and loyalty. This also includes gathering the information currently recorded to the existing rewards and loyalty program of the mall. This is to identify which data has a bearing to the study.

The necessary hardware for the study, which is the NFC-enabled cards and readers were scouted and acquired for use in the development.

The researcher also looked into the algorithm used in the existing rewards system of the mall. In addition to that, another algorithm was researched to be introduced to the study in order to enhance the existing rewards and loyalty system of the mall.

The expected deliverables for this phase were gathered and analyzed data and plan from interviews and research in preparation for the design of the system.

Phase 2: Design. This phase is focused on interpreting and designing the data gathered in the previous phase. The necessary information gathered from the rewards and loyalty system were assessed whether additional data are needed to be recorded or not. As for the algorithm that was used, the researcher designed a semantics that is used in the development of the system which enhanced the rewards and loyalty program. The system was also designed using Software Diagrams and Database Structures like Entity Relationship Diagram and Context & Data Flow Diagram. This also includes the algorithm, specifically the semantics of K-means Clustering, RFM Calculation and Net Promoter Score, that were used in the development of the system.

Phase 3: Develop. This phase starts the development of the system. All the information gathered, analyzed and designed were used to construct the required system. The researcher developed the system as a web-based application that can be launched in internet browsers. PHP, MySQL and JQuery are the primary programming languages and database application used in order to come up with the system. NFC technology was also embedded during the development phase to ensure that rewards and loyalty system is tied up with the information on the system being developed. It was expected to come up with an untested yet working framework of the system. This was refined through system testing in the next phase.

Phase 4: Testing. The system testing used Black Box and White Box Testing methods. This is to ensure that the requirements set at the early stage are all included in the development of the system. The refined system was expected as a deliverable from this phase ready for deployment.

Phase 5: Deploy. Once the optimal working system is developed, it was readily deployed to test as its beta version. Though there were revisions, it was addressed in the next iteration until the system was completed.

Phase 6: Review. The UAT questionnaires used served as one of the feedback instruments to identify whether the system addressed the requirements set at the early phase. Features that needed further modification was applied in the next iteration. Findings and feedbacks were the expected deliverables from this phase dependent on the outcome of the evaluation of the system.

Data Analysis

The UAT Questionnaire was used as one of the research instruments, which was reviewed by five validators before it was administered to the respondents. The rating scale is shown in below which was used to interpret the responses.

Box 1:

UAT Validation Rating Scale. Likert-type Scale Response Anchors 5-point Level of Agreement

Scale	Interpretation
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Strongly Agree (5) – complete agreement that the system as a whole is functioning excellently in terms of usability and functionality;

Agree (4) – mostly agree that the system as a whole is functioning well in terms of Usability and functionality;

Neutral (3) – somewhat agree that the system as a whole is functioning well and moderately good in terms of usability and functionality;

Disagree (2) – mostly disagree that the system as a whole is functioning fairly in terms of usability and functionality; and

Strongly Disagree (1) – complete agreement that the system as a whole is functioning poorly in terms of usability and functionality.

The UAT Validation test result supports the User Acceptance Test Questionnaire. The Total Mean of 4.75 which interprets that the validators Strongly Agree to the use of the User Acceptance Test as a rating scale.

data gathered from the User Acceptance Testing (UAT) questionnaires are systematically analyzed to ensure accurate interpretation and the formulation of valid conclusions. The responses collected from the respondents provide essential feedback regarding the system's usability and functionality. These data help determine whether the developed system meets the needs and expectations of its intended users. The analysis focuses on evaluating each indicator identified in the study. To interpret the results, the Weighted Mean Interpretation method is utilized. This method allows for the computation of average ratings for each criterion based on respondent feedback. The use of weighted mean ensures consistency and objectivity in assessing the system's performance. The computed values are then compared against the predefined rating scale. This process helps identify the level of acceptability of the system. The Weighted Mean Interpretation of the UAT Rating Scale for Usability and Functionality is presented in Box 2 on the succeeding page.

Numerical Equivalent	Description	Interpretation
Weighted Mean	Usabilityand Functionality	
4.21 – 5.0	Very Efficient	The level of efficiency is very high at 84% - 100%
3.41 – 4.20	Efficient	The level of efficiency is high at 68% - 83%
2.61 – 3.40	Moderately Efficient	The level of efficiency is

		moderate at 52%-67%
1.81 – 2.60	Inefficient	The level of efficiency is low at 36% - 51%
1.00 – 1.80	Very Inefficient	The level of efficiency is very low at 0% - 35%

Box 2:

Weighted Mean Interpretation of UAT Rating Scale for Usability and Functionality

Very Efficient (4.21-5.0) – The usability and functionality as a whole are good, and it is very usable and acceptable;

Efficient (3.41-4.20) – In terms of the usability and functionality, the system as a whole is operating well;

Moderately Efficient (2.61-3.40) – Overall, the system is operating smoothly, but it is only somewhat effective in terms of usability and functionality;

Inefficient (1.81 – 2.60) – In terms of usability and functionality, the system as a whole is fair; and

Very Inefficient (1.00 – 1.80) – The system as a whole has weak functionality and few useable features.

Ethical Considerations

The ethical considerations being considered in the study are meant to protect the respondents and the researcher for any legal implications. It ensures that the identity of each respondent will be kept confidential and were not used on any other means except of the study as an alignment to compliance with the legal rights of the respondents according to Republic Act 10173 or the Data Privacy Act of 2012.

Voluntary Participation

The participation of the respondents in the study was voluntary and through informed consent that there are no means of force or deception used to have them involved. The respondents are agreeable on the terms of their participation and the protection of the rights.

Informed Consent

The respondents are oriented of their role and responsibilities as they participated in the study by allowing them to sign a non-disclosure and data privacy agreement upon registration of their sample loyalty cards. This is a binding agreement between the mall management, the researcher and the respondents.

Data Confidentiality

This also covers the personal information divulged by the respondents in the course of the study. This includes the information that were stored in the NFC-enabled cards up to the generation of the marketing analytics report. It ensures that all information were used for research purposes only. During the participation of the respondents, they are oriented of the purpose of the study and their rights being protected as the study was conducted. Also, the selection of the respondents is based on the randomly selected purposive sampling. They are not somehow related or acquainted with the researcher of the study. It was ensured that there were no any means of discriminatory actions done in the selection process.

Upon the conclusion of the study and all the trials are done, results are available and communicated to the participants through a text message sent to their personal numbers and were also emailed with the result so

keep them in transparency.

RESULTS AND DISCUSSIONS

This chapter presents the results and key findings derived from the data gathered during the study. It discusses the features of the developed system, with emphasis on the implementation of Near Field Communication (NFC) in the Loyalty Program and Rewards system practiced in the industry. The chapter explains how NFC technology improves transaction efficiency, user convenience, and customer engagement. It also analyzes how the system addresses the limitations of traditional loyalty programs. The discussion is supported by interpretations of the collected data to demonstrate the system's effectiveness.

Furthermore, this chapter examines the impact of Marketing Analytics as an integral feature of the system. It highlights how analytics provide valuable insights into customer behavior and purchasing patterns to support better marketing decisions. The justification of the results is presented in relation to the objectives of the study and existing industry practices. Conclusions are drawn based on the analyzed findings regarding the system's overall performance. Lastly, recommendations are provided for future improvements and further research.

Discussion

The results and interpretation of the data gathering using the research instruments are presented were thoroughly gathered, analyzed and processed to come up with results and findings to support the study of the researcher. in the following next pages.

Marketing Analytics and Customer Rewards Scheme in the Retail Industry

Table 1.

Summary of Consolidated Interview Results

Questions	Summarized Answers
1. What is your experience in using or managing the proposed Mall Rewards Loyalty Program during Mall Marketing and Promotions?	• User-Friendly
	• Independent from reliance to Head Office Report
	• Strategic Tool for driving customer engagement
	• Real-time transactions and meaningful reports
	• Better loyalty scoring for rewards purposes
	• positive feedback in terms of:
	○ efficiency
	○ usefulness
	○ inclusion of all mall stores in the loyalty program
2. Do you have any issues with the use of the proposed Rewards and Loyalty Program?	• No issues were encountered
	• Open for future improvements
3. Are there any other malls that uses Rewards and Loyalty Program that you are aware of? If yes, who are they and what do you think is your mall's advantage and disadvantage over their loyalty and	• KCC Malls, Robinsons Place and Ayala Malls
	• SM City General

rewards program?	Santos offered better Rewards and Loyalty Program:
	○ full participation of mall stores regardless, they are mall-affiliated or not
	○ better and improved loyalty
	○ flexibility
	● Exclusivity use of the proposed system to SM City General Santos
4. Is there anything you would like to improve in the proposed Rewards and Loyalty Program?	● New concept to the business
	● User Interface can be improved in terms of aesthetics
5. How satisfied are you with the proposed Rewards and Loyalty Program of the mall in terms of managing it including reports generation and system functionalities?	● Highly Satisfied

Marketing Analytics has been a pivotal technique in the retail industry in ensuring the thriving progress and success of a company. Specifically, as Verhoef et al. (2019) elaborated that on business industry, the opportunity to gather data and analyze the customer behavior is one way to understand the market of the said business. One of the marketing activations resulting to effective marketing analytics is the Customer Rewards Scheme from Loyalty Memberships that allows the business to provide better marketing promotions, understand customer loyalty and provide rewards which will drive more sales and foot traffic (Kumar et al., 2019).

The study decided to tap into the potential of Marketing Analytics and Customer Rewards by presenting a more flexible and accurate algorithms to calculate and come up with better loyalty grade for customers which will be the basis of the business to understand the market basket and buying power of the customers in the community where the business belonged as supported by Kumar et al. (2019) the importance of customer segmentation to effectively capture the customer behavior and present a firm marketing analytics to understand what drives the business.

The results from the Consolidated Interview Results done, as shown in Table 1, provides an information of that other malls like KCC Malls, Robinson's Place, Ayala Malls and 7-11 Convenience Store implements Loyalty and Rewards Scheme though, all respondents agreed that only SM City General Santos with the implemented proposed Marketing Analytics and Rewards Loyalty Program has a more effective approach in providing customer satisfaction and better translation of their customer behavior as loyalty scores. The other mentioned establishments still follow the monetary value basis only for the translation of customer loyalty whereas, the proposed system provided a more robust and flexible translation that best describes customer behavior and buying power.

As a result of the findings on the importance of Marketing Analytics in the retail industry, it implies that there are a very substantial and problem-worthy issues that needs to be addressed. The absence of Marketing Analytics and independence from the reports provided by the Head Office caused delays in their marketing studies in understanding the market basket of the mall. This also hampers their ability to come up with effective marketing events, promotions and rewards that will drive foot traffic and sales to the mall. Thus, the researcher, after a series of analysis and evaluation of the results from the interview, presented an innovative plan presented to the Mall Management and concerned departments, including Marketing, Leasing and Operations, to address the identified problem on Marketing Analytics, Loyalty and Rewards Program of the mall.

The findings from both data gathering and research instruments used presented in this section leads to a conclusive realization that the proposed system and loyalty scheme is timely and innovative to be taken into consideration by the Mall's Marketing Team to adapt and use to gather their own marketing analytics data based on the market basket the mall is supporting. It will provide a more scalable and dynamic approach to understand the customers of the mall and how they will be enticed to support the mall through their loyalty and rewards system.

Though the proposed system and loyal scheme is at the stage of focusing on Marketing Analytics and on a mall terminal basis, it is recommended that implementation of a mobile application to provide alternative access for customers to view their customer loyalty information, rewards and perks, which will drive them to strengthen their patronization towards the mall.

Problems and Issues of Existing Loyalty Program

Marketing Analytics has been a trend and an edge in the industry in terms of understanding the customer behavior in terms of purchase thus providing better marketing strategies and promotions that will address and align with the customer satisfaction and experience Breugelmans et al (2020). Tied up with the Loyalty and Rewards Program, implemented with RFM Score Analysis via marketing analytics will also be able to provide better loyalty and rewards program for the mall customers that have been a patron of the establishment Chaudhuri and Majumder (2019).

The Consolidated Interview Results, as seen in Table 1, provide and confirm the lack of marketing analytics capabilities in the existing Marketing Analytics of the mall and solely dependent on the data provided by Head Office which is not real-time and synchronously accessible, delays the marketing strategies planning and implementation to address the customer's needs. Customers do not have visibility also over their Loyalty and Rewards Membership, which can also cause confusion in understanding the importance of loyalty and rewards membership perks and advantages.

It was also pointed on the Consolidated Interview Results, as shown in Table 1, that the appreciation on seeing a new approach in calculating and assessing their loyalty score will break the biased rating, which is currently practiced by the establishment, where it is focused solely on the monetary or buying power only of the customer thus, other customers who are not equipped with this advantage are rated low or with limited loyalty perks. This discussion has been elaborated Chen Huang Liu (2020) with the importance of understanding customer loyalty with the use of RFM Rating. It was appreciated that the proposed loyalty scheme focused on Recency, Frequency and Monetary (RFM) rating allows to break biased ranking and evaluation of the loyalty scores for each customer. From one dimension, which is monetary, the proposed system allows other customers to be also rated now according to three dimensions, which is Frequency and Recency and not just Monetary alone.

The study provided an implication focusing on the importance of customer segmentation to properly understand and appreciate the importance of Loyalty Program Schemes with businesses. It clarifies the importance of having different dimensions of segmentations will provide more robust and accurate analysis and interpretation of customer loyalty which will be pivotal basis for the rewards scheme to be considered by the business. Thus, the study focusing on three-dimension segmentation of Recency, Frequency and Monetary Value instead of the existing Monetary value only will properly interpret and provide accurate analysis and translation of quantitative data sets to actual customer loyalty scores.

The importance of RFM Scoring Analysis tied up with K-Means Clustering and NPS Scoring in grouping customers according to the identified dimensions concluded that it has effectively provided and supported the Loyalty and Reward Scheme used in the study as it garnered positive feedbacks from the customer as respondents of the study as presented in Table 1. This provides additional information to the business industry to adapt a new Loyalty Scheme not solely focused on one-dimension segment but multiple-dimension segments that can be considered to interpret accurate results for the loyalty scoring of customer and better opportunities for Marketing Campaigns.

As the proposed system was deployed with full functionality, it still gained recommendations from respondents on the possibility to implement advanced marketing analytics not limited to demography, customer purchasing behavior and level of loyalty thus implementing Hybrid K-Means Clustering, specifically Fuzzy Clustering, as discussed by Li et al. (2021). This opens a bigger opportunity for the proposed system to be expanded and scaled to a level that it will specifically enhance the Marketing Analysis and interpretation of the Loyalty and Rewards Scheme of the businesses that will implement it in the future.

Content and Features of Near-Field Communication (NFC) Loyalty Program and Analytics

The development of the Near-Field Communication (NFC) Loyalty Program and Analytics is heavily dependent on the data gathered and analyzed to accurately interpret and assess the needs of both customers and mall establishments. These data serve as the foundation for identifying system requirements and defining the core functionalities of the proposed solution. During the development phase, the analyzed data are used as a reference in designing the software architecture of the system. The software architecture illustrates the overall system design through various models, including the Use-Case Model, Entity Relationship Diagram, Data Flow Diagram, and Physical Environment Requirements. These components provide a clear and structured representation of how the system will operate and interact with its users and data. Based on this architectural design, the system is developed by translating the gathered data into actual system features and functional modules. The architecture also ensures that the system is scalable, efficient, and aligned with industry practices. All aspects of the software architecture and development process are discussed in detail below.

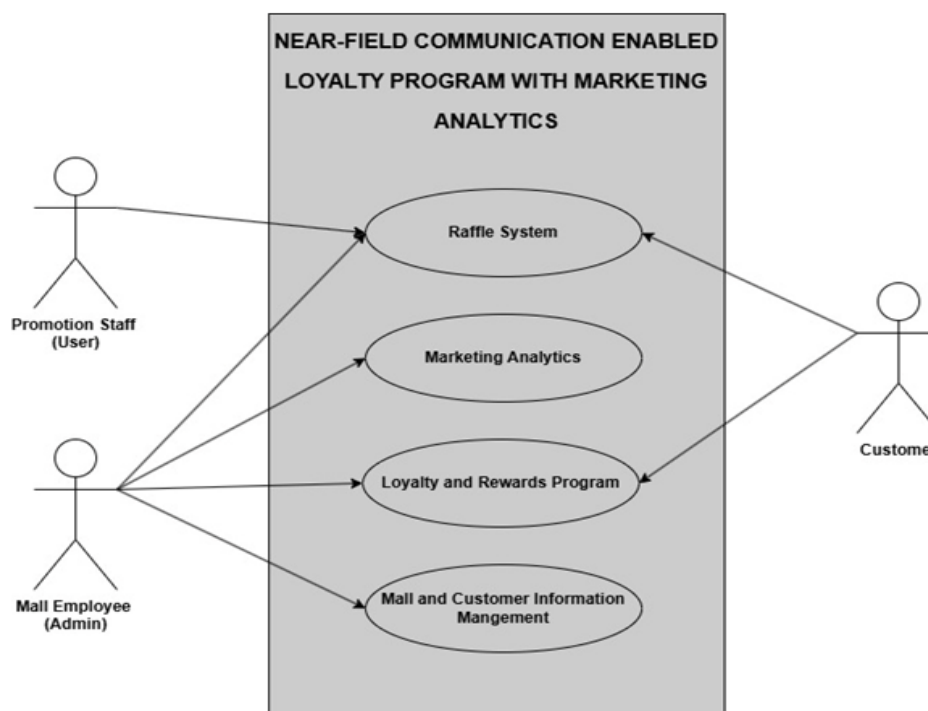


Figure 4. Use Case Diagram

The Use-Case Model is an essential part of system analysis and design as it represents the functional requirements of a system from the perspective of its users. It identifies the system actors and describes their interactions with the system, providing a clear understanding of how system functions support user goals. This model helps ensure that system development is aligned with user requirements and organizational processes, reducing the risk of misinterpretation during implementation (Sommerville, 2016). Additionally, the Use-Case Model supports effective communication among stakeholders by presenting system behavior in a simple and structured manner. In modern software engineering practices, it remains a core element of the Unified Modeling Language (UML) and is widely used for requirement validation, system design, and testing (Object Management Group, 2021).

The Use-Case Model in Figure 4 shows how the three key actors, Promotion Staff (User), Mall Employee

(Admin), and Customers interact with the system developed. The system includes four modules: Raffle System, Marketing Analytics, Loyalty and Rewards Program and Mall and Customer Information Management. Each actor is interacting with specific-related modules they have bearing with. For Promotion Staff (User), they will be interacting with Raffle System module where they will be responsible for the redemption processing of raffle entries. The Customers will be interacting with both Raffle System, responsible for their personal information entries and raffle redemption transactions, and Loyalty and Rewards Program module which will provide them overview of their loyalty score and redemption trail history. Finally, the Mall Employee (Admin), will have the vital role of accessing all four modules. For Raffle System, they serve as the overseeing personnel to manage and process the raffle redemptions including the raffle draws. For Marketing Analytics, they will be able to visualize and perceive the translation of the customer behavior based from the raffle redemption and how it will be translated to vital mall marketing strategies in coming up future promotions. The Loyalty and Rewards program allows the Mall Employee to foresee the overall loyalty scores and the trend in the customer support given to mall stores. Finally, the Mall and Customer Information Management allows the Mall Employees to manage the customer and other mall employee information.

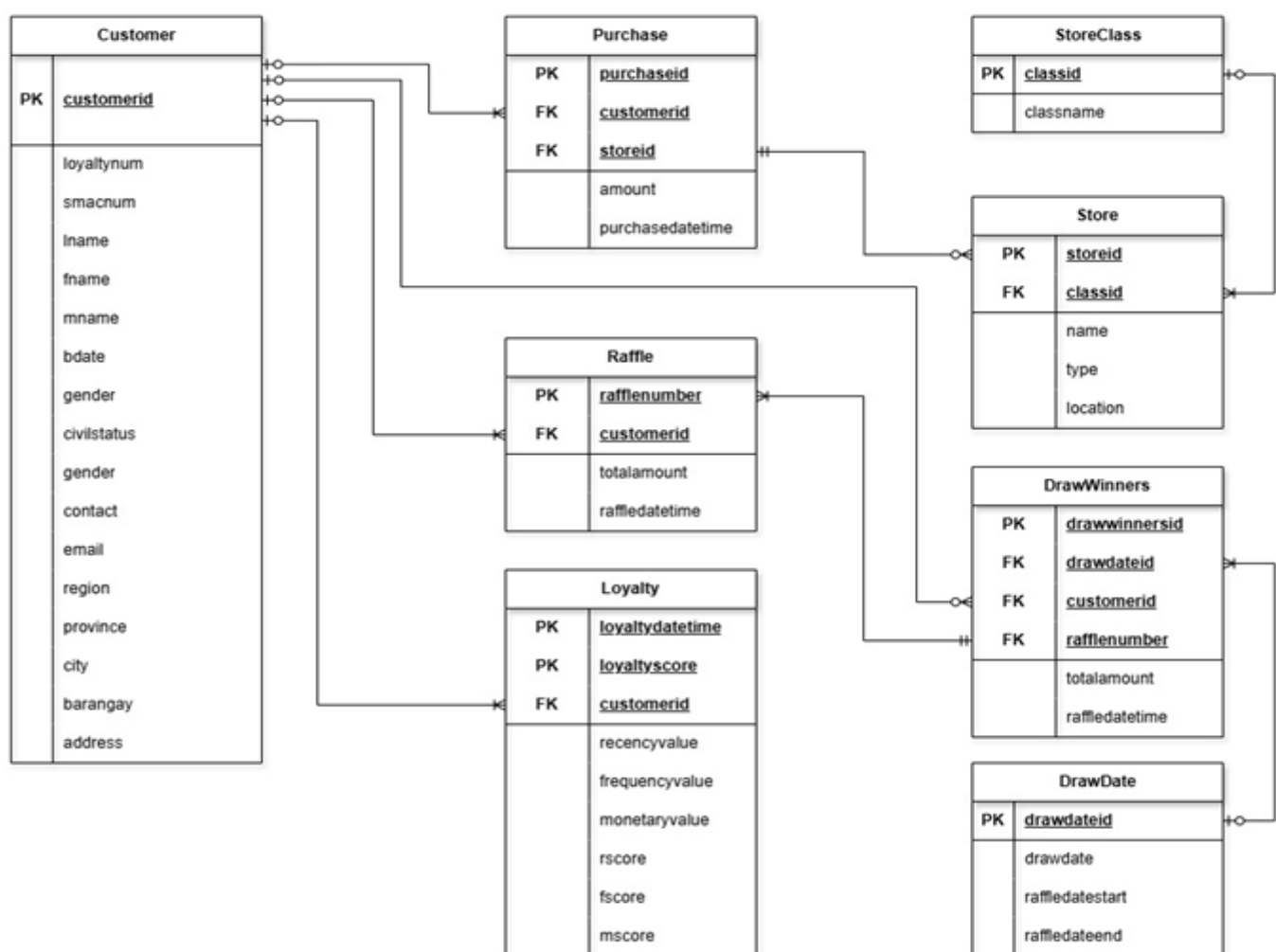


Figure 5. Entity Relationship Diagram

The Entity Relationship Diagram (ERD) is a core conceptual data modeling tool used in information systems and database design to visually represent the structure of data and the relationships between different data elements. In the context of database design, an ERD depicts entities such as people, objects, or concepts, their attributes, and the connections among them, allowing analysts and developers to conceptualize data requirements before implementation in a database system (Kirvan et al, 2025). This graphical representation serves as a blueprint for designing relational databases, ensuring that the system's data architecture accurately reflects real-world requirements and supports efficient data storage and retrieval throughout the system development life cycle (Kirvan et al, 2025). Academic texts on database design emphasize that ERDs are essential for mapping out clear database structures and guiding the transformation of conceptual models into

logical and physical database schemas (Bagui & Earp, 2023).

As seen on Figure 5, the Entity Relationship Diagram for the system developed shows how the implementation of the relational database structure. It presents two of the main entities with relationships: Customer and Store, three relationships: Purchase, Raffle, Loyalty while it has sub-entities which were additional supporting entities to expound and properly manage the database information storing: Draw Date, Draw Winner and Store Class.

All the transactions done of a customer with a store will be stored in the Purchase entity. In turn, all the information stored in the Purchase entity is dependent during the raffle redemption process tied up with the Raffle Entity. Finally, the Loyalty entity will be responsible for managing all the processing of the data stored in the Purchase and Raffle Entity driven by algorithm-based stored procedures for the calculation and interpretation of customer data and behavior which is presented in the Marketing Analytics and Loyalty and Program module. Other sub-entities like the Draw Date and Draw Winner are auxiliary entities to support the raffle redemption data management while the Store class sub-entity serve as an aggregated data of each store stored in the Store entity.

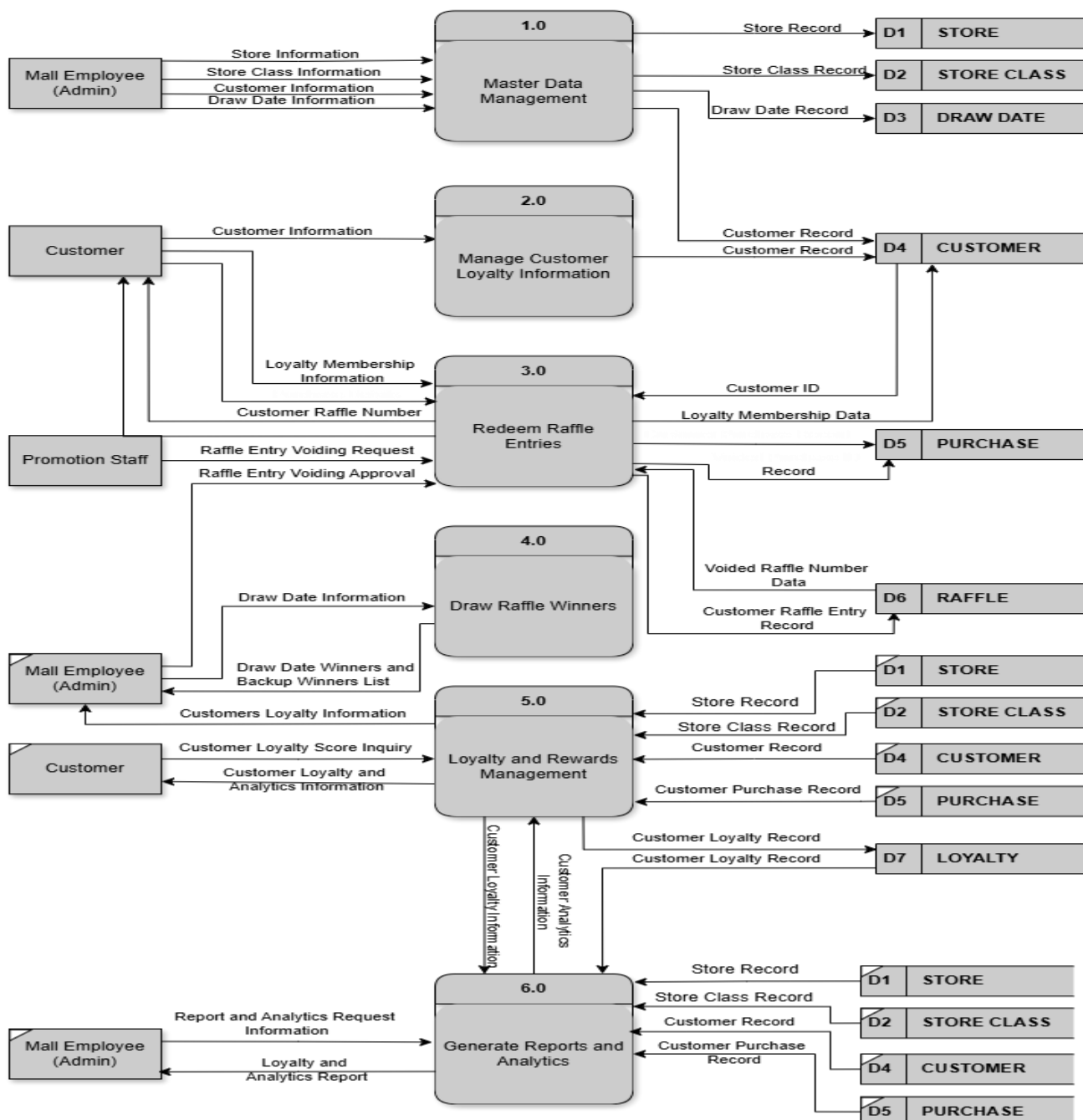


Figure 6. Data Flow Diagram Level 1

A Data Flow Diagram (DFD) is a key analytical tool used in systems analysis and design to present a visual representation of how data moves throughout a system, highlighting the processes that transform data, the data stores that retain information, and the sources and destinations of data flows. Hathaway and Hathaway (2016) explain that DFDs help practitioners capture workflows and illustrate the logical sequence of data processing without focusing on technical implementation, making them valuable for requirements elicitation and system planning.

DFDs play a critical role in validating functional requirements and guiding subsequent stages of design and implementation by ensuring that data flows are logically consistent and aligned with user needs.

Figure 6 shows the Data Flow Diagram (DFD) Level 1 of the system developed. It is based on the Entity Relationship Diagram for the data repository and presents how the data flow from the actors in the Use-Case Model and how it is processed within the system according to each of the system's module. It presents the data processing and flow from User and Customer Management including the Master Data Management done by the Mall Employee (Admin), until the Redemption of the Raffle Entries, Drawing of Winners, Translation of the Loyalty and Rewards of the Customer and Interpretation of all the data into Marketing Analytics were the three main actors involved: Customer, Mall Employee and Promotion Staff.

To properly implement the development of the system, the Physical Environment Requirements need to be set into ground. This covers both of the System and the Developer and End User Tech Stack and Resources and the Hardware and Software Requirements in the used in the development and deployment. It also includes the Development Cost for both Hardware and Software.

Table 2.

Developer Tech Stack and Resources

Software	Hardware
XAMPP 8.2.12-0	Processor: AMD Ryzen 7 7435HS 3.16 @ 16 core (optimal)
Backend: PHP, MySQL	RAM: 16GB (optimal)
Frontend: HTML5, CSS3, JavaScript	Storage: 1TB (optimal)
Notepad / Visual Studio Code	Internet: 50MBps minimum speed

Table 2 presents the Developer Tech Stack and Resources which were pivotal in the system development. It presents the optimal tech stack requirements used by the researcher to develop the system.

Table 3.

End-User Tech Stack and Resources

Software:
Web Browser: Google Chrome
Operating System: Microsoft Windows 10 Professional
Hardware: Lenovo ThinkCentre M70 Series (Mall-provided) at Intel Core i3 with 8GB RAM (minimum)
Internet: 50MBps minimum speed (using the mall internet infrastructure)

Table 3 presents the End-User Tech Stack and Resources which serves as the deployment resources used for the system.

Box 3:

Software Cost

Software / API	Cost
Visual Studio Code/JavaScript/HTML/CSS	Free
MySQL, PHP via XAMPP 8.2.12-0	Free
Web hosting	Free (using Mall infrastructure)
Server	Free (using Mall infrastructure)

Box 3 presents the Software Cost necessary for the successful progression of the study. It details both the acquisition costs, which cover the purchase or licensing of the required software, and the usage costs, which include any recurring fees, maintenance, or subscription expenses associated with the software. The box provides a clear breakdown of the financial resources needed to implement the system effectively. By outlining these costs, the study ensures transparency in budgeting and resource allocation.

Box 4:

Hardware Cost

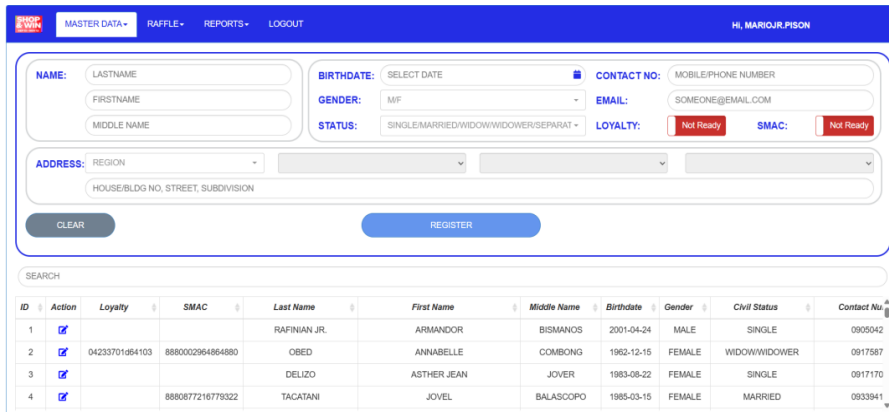
Hardware	Cost
Raffle System Terminal	₱45,000 (provided by Mall)
NFC Card Reader Terminal	₱1,100
NFC Cards (For Testing Purposes)	₱5 each (200 pcs at ₱1000)
Internet Plan	Free (using Mall infrastructure)

Box 4 presents the Hardware Cost required for the study to progress effectively. It outlines both the acquisition costs, covering the purchase of necessary equipment, and the usage costs, which may include maintenance, upgrades, or operational expenses. The table provides a clear overview of the financial investment needed to support the system's hardware requirements.



Figure 7. Marketing Analytics Dashboard

Figure 7 shows the Marketing Analytics Dashboard where it provides the overview of the results from the customer purchases registered in the system. It provides the customer statistics on Gender, Demography, Age and Membership. As for the mall store statistics, it provides the store class overview, stores, purchase value, day and time of purchase and even demography.

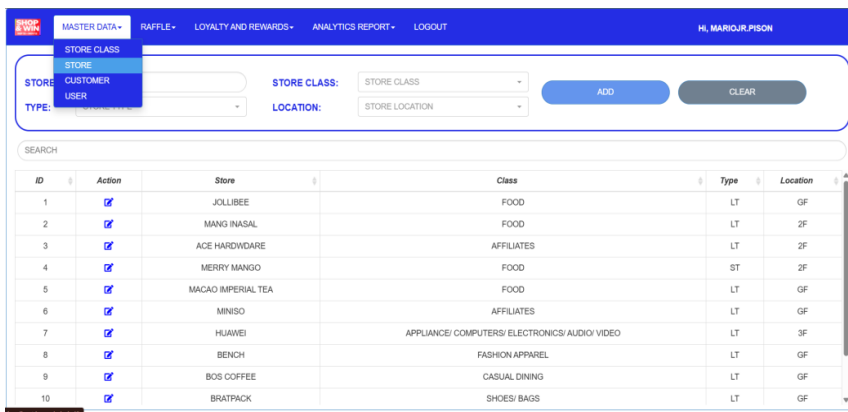


The interface shows a registration form with fields for Name (Last Name, First Name, Middle Name), Birthdate, Gender, Status, Contact No., Email, Loyalty, and SMAC. Below the form is a table of existing customers.

ID	Action	Loyalty	SMAC	Last Name	First Name	Middle Name	Birthdate	Gender	Civil Status	Contact No.
1	☒			RAFINAN JR.	ARMANDOR	BISMANOS	2001-04-24	MALE	SINGLE	0905042
2	☒	042370184103	8880002964864880	OBED	ANNABELLE	COMBONG	1962-12-15	FEMALE	WIDOW/WIDOWER	0917587
3	☒			DELIZO	ASTHER JEAN	JOVER	1983-08-22	FEMALE	SINGLE	0917170
4	☒		8880877210778322	TACATANI	JOVEL	BALASCOPO	1985-03-15	FEMALE	MARRIED	0933941

Figure 8. Customer Information Management

Figure 8, as shown above, Customer Information Management allows management of the Customer information in the system and register them.



The interface shows a form to add a new store with fields for Store Class, Store Type, Location, and a button to add the store. Below the form is a table of existing stores.

ID	Action	Store	Class	Type	Location
1	☒	JOLIBEE	FOOD	LT	GF
2	☒	MANG INASAL	FOOD	LT	2F
3	☒	ACE HARDWARE	AFFILIATES	LT	2F
4	☒	MERRY MANGO	FOOD	ST	2F
5	☒	MACAO IMPERIAL TEA	FOOD	LT	GF
6	☒	MINISO	AFFILIATES	LT	GF
7	☒	HUAWEI	APPLIANCE/ COMPUTERS/ ELECTRONICS/ AUDIO/ VIDEO	LT	3F
8	☒	BENCH	FASHION APPAREL	LT	GF
9	☒	BOS COFFEE	CASUAL DINING	LT	GF
10	☒	BRATPACK	SHOES/ BAGS	LT	GF

Figure 9. Mall Store Information Management

The Mall Store Information Management, as shown in Figure 9 where the admin can manage the Store information in the system and associate it with the Store Class it belongs. The information in this module is also vital in the Raffle Redemption Module, Marketing Analytics and Loyalty Program.



The interface shows a table of raffle entries and a table of winners.

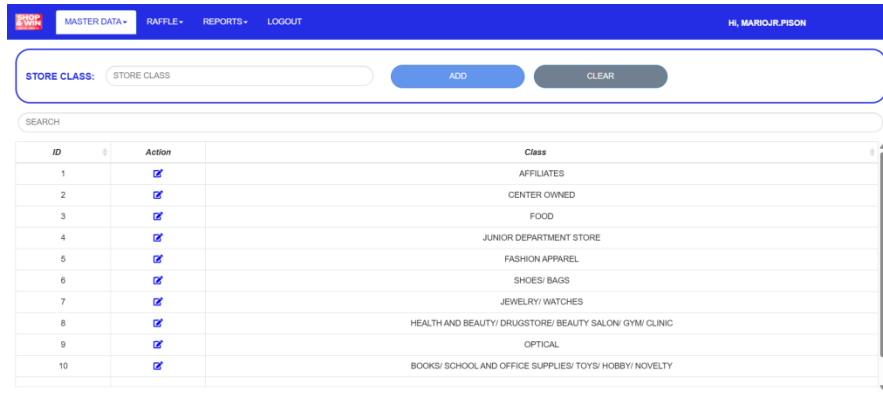
Raffle Number	Total Amount	Raffle Date
1000002181	6095	November 02, 2023 04:05:10 PM
1000002182	6095	November 02, 2023 04:05:10 PM
1000002183	6095	November 02, 2023 04:05:10 PM
1000002184	6095	November 02, 2023 04:05:10 PM
1000002185	6095	November 02, 2023 04:05:10 PM
1000002186	6095	November 02, 2023 04:05:10 PM
1000002187	0	November 02, 2023 04:05:53 PM
1000002188	0	November 02, 2023 04:05:53 PM
1000002189	9570	November 03, 2023 05:28:56 PM

TOTAL ENTRIES: 80

Raffle Number	Customer Name	Amount	Redemption Date
1000002080	SOLO GABA, LUNETTE GALE VILLANUEVA	12437	2023-11-05 19:49:54
1000002084	ARLOS ARGIE CADAPLE	16253	2023-11-12 19:59:57
1000002081	SARIFA, ROLLY BOLDEVILLA	35467	2023-11-05 17:30:49
1000002082	SENAGAN, APRIEL ROSE GONZALES	4909900	2023-11-11 15:46:12
1000002083	SENAGAN, APRIEL ROSE GONZALES	4909900	2023-11-11 15:46:12
1000002084	YUL, SHEENA CHARISE TIO	34118	2023-11-09 20:35:47
1000002085	GAUMBA, PRECIOUS ANGE BOBILLO	72014	2023-11-08 19:36:07

Figure 10. Raffle Management

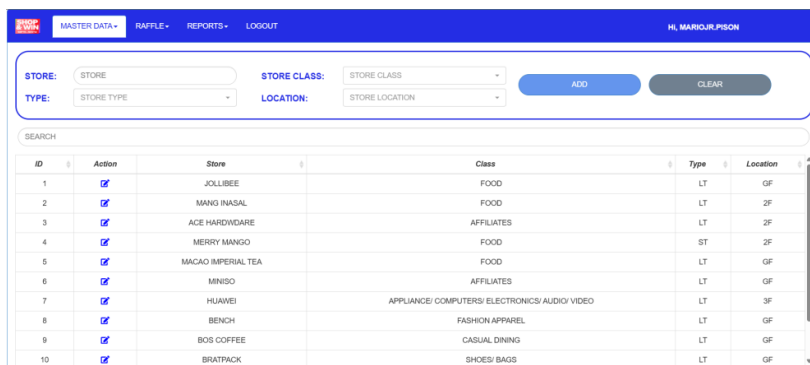
When the cut-off of the draw date has been set based on the mechanics of the raffle promo, the administrator can initiate drawing of raffle entries, as shown in Figure 10, based on the start and end raffle dates. This will display all the valid raffle entries for that date. The DTI representative will be present to witness the raffle draw and sometimes advices to initiate the shuffling of the raffle entries using the Shuffle button. The admin can also set the number of winner and back-up count to draw before initiating the Draw button. This will display the number of winners and back-up winners set on the right-side pane which will be ready for printing and countersigning with the witnesses and DTI representatives.



ID	Action	Class
1	☒	AFFILIATES
2	☒	CENTER OWNED
3	☒	FOOD
4	☒	JUNIOR DEPARTMENT STORE
5	☒	FASHION APPAREL
6	☒	SHOES/ BAGS
7	☒	JEWELRY/ WATCHES
8	☒	HEALTH AND BEAUTY/ DRUGSTORE/ BEAUTY SALON/ GYM/ CLINIC
9	☒	OPTICAL
10	☒	BOOKS/ SCHOOL AND OFFICE SUPPLIES/ TOYS/ HOBBY/ NOVELTY

Figure 11. Master Data Module – Store Class Information Management

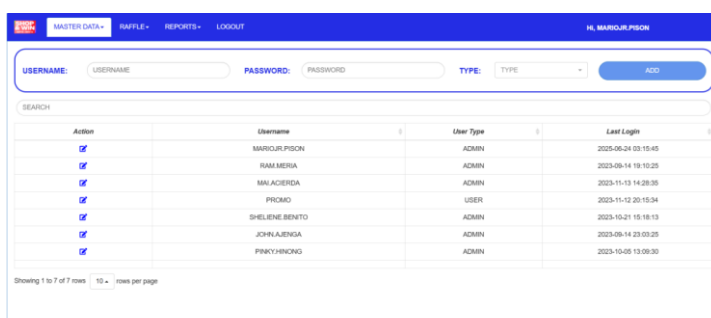
As shown in Figure 11, the admin who logged in to the system will be automatically directed to the Store Class Information Management, where they can manage the different type of store classes available in the mall which will be the basis for other information and features of the system including Raffle Redemption and Marketing Analytics.



ID	Action	Store	Class	Type	Location
1	☒	JOLIBEE	FOOD	LT	GF
2	☒	MANG INASAL	FOOD	LT	2F
3	☒	ACE HARDWARE	AFFILIATES	LT	2F
4	☒	MERRY MANGO	FOOD	ST	2F
5	☒	MACAO IMPERIAL TEA	FOOD	LT	GF
6	☒	MINISO	AFFILIATES	LT	GF
7	☒	HUAWEI	APPLIANCE/ COMPUTERS/ ELECTRONICS/ AUDIO/ VIDEO	LT	3F
8	☒	BENCH	FASHION APPAREL	LT	GF
9	☒	BOS COFFEE	CASUAL DINING	LT	GF
10	☒	BRATPACK	SHOES/ BAGS	LT	GF

Figure 12. Master Data Module – Store Information Management

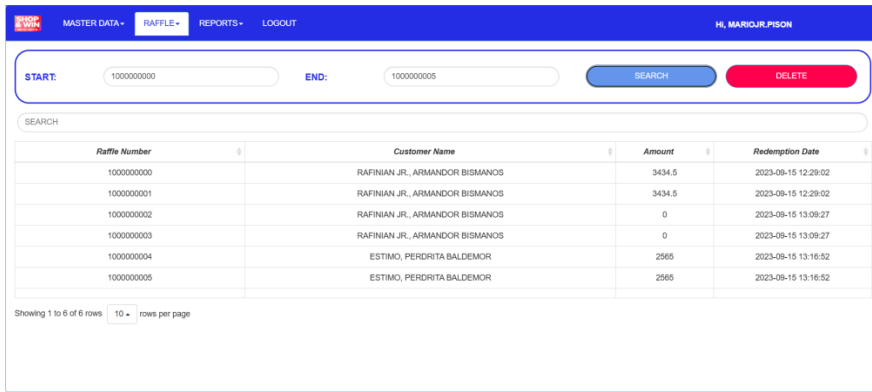
The Master Data Module also contains the Store Information Management, as shown in Figure 12 where the admin can manage the Store information in the system and associate it with the Store Class it belongs. The information in this module is also vital in the Raffle Redemption Module, Marketing Analytics and Loyalty Program.



Action	Username	User Type	Last Login
☒	MARIOUR.PISON	ADMIN	2025-06-24 03:15:45
☒	RAM.MERIA	ADMIN	2023-09-14 19:10:25
☒	MAUACIERDA	ADMIN	2023-11-13 14:28:35
☒	PROMO	USER	2023-11-12 20:15:34
☒	SHELENE.BENITO	ADMIN	2023-10-21 15:18:13
☒	JOHN.ABENGA	ADMIN	2023-09-14 23:03:25
☒	PINKY.HINONG	ADMIN	2023-10-05 13:09:30

Figure 13. Master Data Module – User Information Management

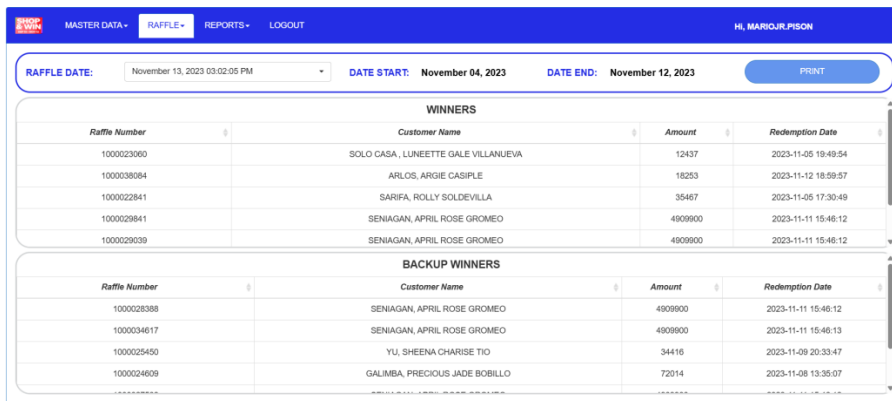
The last module under Master Data that the admin can access is the User Information Management, as shown in Figure 13, where they can manage the user access to the system and assign user roles.



Raffle Number	Customer Name	Amount	Redemption Date
100000000	RAFINIAN JR., ARMANDOR BISMANOS	3434.5	2023-09-15 12:29:02
100000001	RAFINIAN JR., ARMANDOR BISMANOS	3434.5	2023-09-15 12:29:02
100000002	RAFINIAN JR., ARMANDOR BISMANOS	0	2023-09-15 13:09:27
100000003	RAFINIAN JR., ARMANDOR BISMANOS	0	2023-09-15 13:09:27
100000004	ESTIMO, PERDRITA BALDEMOR	2565	2023-09-15 13:16:52
100000005	ESTIMO, PERDRITA BALDEMOR	2565	2023-09-15 13:16:52

Figure 14. Raffle Module – Raffle Entries Voiding

The Raffle Module provides access to the management of Raffle system on the administrator level where one of them is the voiding of raffle entries, as shown in Figure 14, on certain approved conditions. When promotion staff requests for voiding, the admin can access this request and allow the processing of the voiding of raffle entries by entering the range of the raffle entries to void.

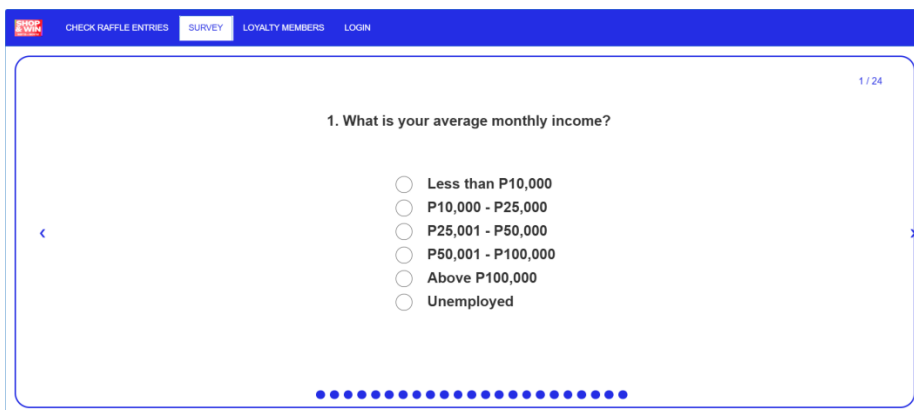


Raffle Number	Customer Name	Amount	Redemption Date
1000023060	SOLO CASA, LUNEETTE GALE VILLANUEVA	12437	2023-11-05 19:49:54
1000038084	ARLOS, ARGIE CASIPLE	18253	2023-11-12 18:59:57
1000022841	SARIFA, ROLLY SOLDEVILLA	35467	2023-11-05 17:30:49
1000022841	SENIAGAN, APRIL ROSE GROMEO	4909900	2023-11-11 15:46:12
1000029039	SENIAGAN, APRIL ROSE GROMEO	4909900	2023-11-11 15:46:12

Raffle Number	Customer Name	Amount	Redemption Date
1000028388	SENIAGAN, APRIL ROSE GROMEO	4909900	2023-11-11 15:46:12
1000034617	SENIAGAN, APRIL ROSE GROMEO	4909900	2023-11-11 15:46:13
1000025450	YU, SHEENA CHARISE TIO	34416	2023-11-09 20:33:47
1000024609	GALIMBA, PRECIOUS JADE BOBILLO	72014	2023-11-08 13:35:07

Figure 15. Raffle Module – Raffle Winners

The admin can also revisit the raffle draw winners and the raffle draw period they won, as shown in Figure 15. This will provide listing of both winners and backup winners where they can proceed to print and file it in their record, if needed.



1. What is your average monthly income?

☐ Less than P10,000
☐ P10,000 - P25,000
☐ P25,001 - P50,000
☐ P50,001 - P100,000
☐ Above P100,000
☐ Unemployed

Figure 16. Inquiry Module – Customer Survey

The customer can also conduct a Customer Survey, as shown in Figure 16, for their feedback about the

marketing promotion events of the mall which will be a basis for additional data gathering step to strategize marketing approach for the mall. This is a specially requested feature of the establishment.



Figure 17. Customer Loyalty Information – Customer Access

Figure 17 shows the customer with proposed NFC-enabled loyalty cards is able to check their loyalty rating and customer behavior which will provide them an overview of their activities and habits spent in the establishment.

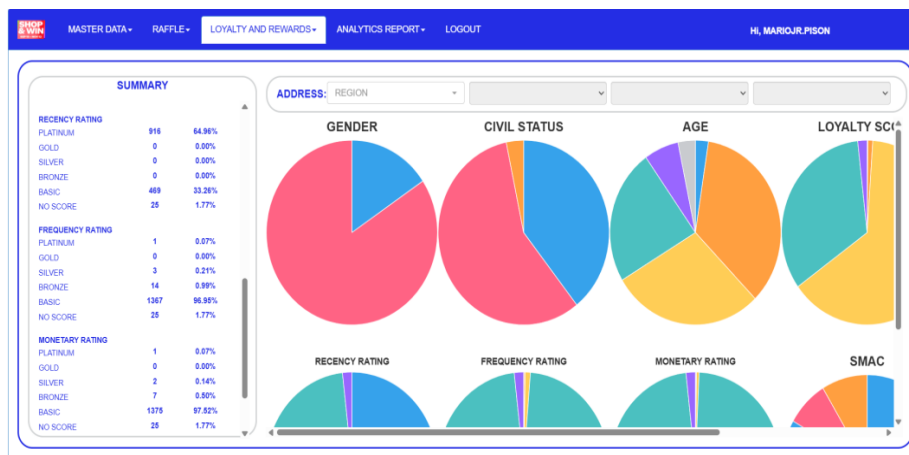
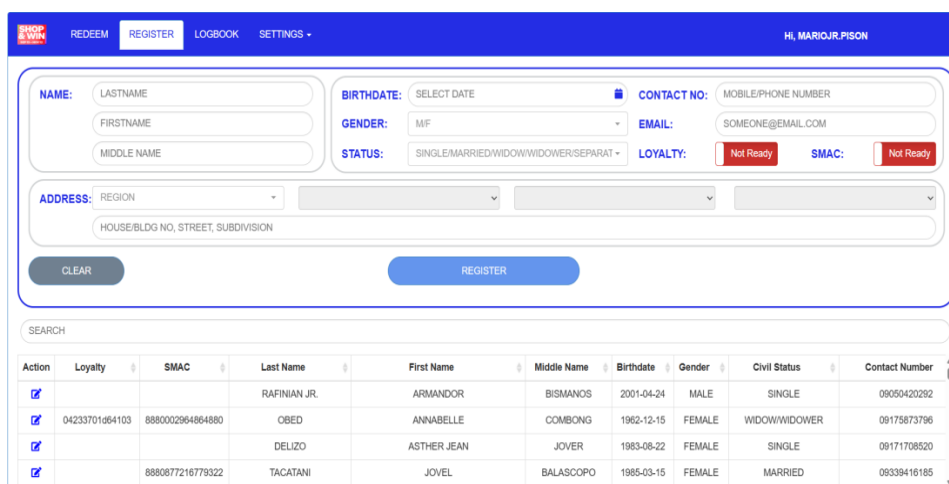


Figure 18. Customer Loyalty Information – Admin Access

The Customer Loyalty Information for Admin Access, as shown in Figure 18, provides overview information of the Loyalty and Rewards Analytics for all customers of the mall. It provides information on the three metrics used to come up with the loyalty score, Recency, Frequency and Monetary, and the actual Loyalty score derived from the metrics.



REGISTER

NAME: LASTNAME, FIRSTNAME, MIDDLE NAME

BIRTHDATE: SELECT DATE

GENDER: MF

STATUS: SINGLE/MARRIED/WIDOW/WIDOWER/SEPARAT

CONTACT NO: MOBILE/PHONE NUMBER

EMAIL: SOMEONE@EMAIL.COM

LOYALTY: Not Ready

SMAC: Not Ready

ADDRESS: REGION, HOUSE/BLDG NO, STREET, SUBDIVISION

REGISTER

SEARCH

Action	Loyalty	SMAC	Last Name	First Name	Middle Name	Birthdate	Gender	Civil Status	Contact Number
☒			RAFINIAN JR.	ARMANDOR	BISMANOS	2001-04-24	MALE	SINGLE	09050420282
☒	04233701984103	8880002964864880	OBED	ANNABELLE	COMBONG	1962-12-15	FEMALE	WIDOW/WIDOWER	09175873796
☒			DELIZO	ASTHER JEAN	JOVER	1983-06-22	FEMALE	SINGLE	09171708520
☒		8880877216779322	TACATANI	JOVEL	BALASCOPO	1985-03-15	FEMALE	MARRIED	09339416185

Figure 19. Customer Registration – User Access

Figure 19 shows the Customer Registration for the User Access that allows the marketing promotion personnel to register new customers to the system.

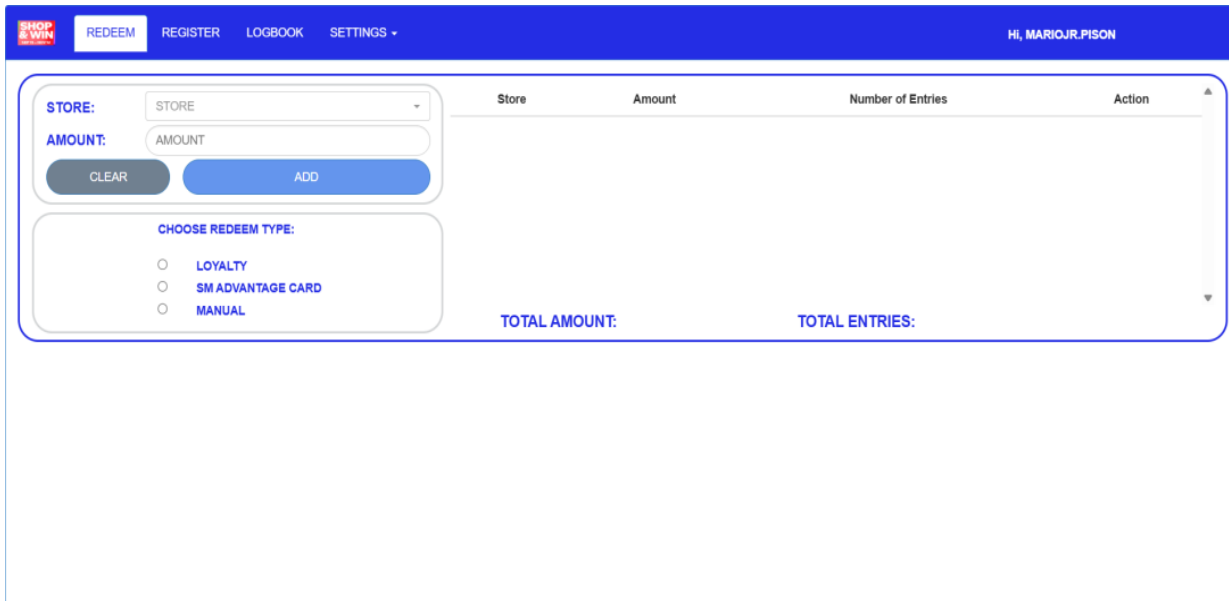


Figure 20. Raffle Redemption – User Access

Once logged in as a User Role in the system, they will be redirected to the Raffle Redemption Module, as shown in Figure 20, where promotion staff may proceed with the redemption of raffle entries based on the purchases of the customer. The user will be required to select the store where the customer purchased and the amount purchased to qualify for raffle entries. They will be able to add multiple purchases which will be calculated for eligible raffle entries. The user will also have an option to select three types of redemption: Loyalty, use of the proposed NFC-enabled Loyalty card released to the customer, SM Advantage Card, for existing Loyalty membership card of the mall and Manual, for those who do not have any membership, which will require them to have their data inputted to the system manually. Once the redemption type has been chosen, it will automatically provide an e-raffle number entry. In cases where the customer has not yet registered their loyalty membership cards in the system, the user will initiate registration.

The proposed Near-Field Communication Loyalty and Rewards Program with Marketing Analytics implemented with Raffle System was developed to address the existing problem of the retail industry in terms of having a Marketing Analytics tool, Customer Loyalty evaluation and understanding the target market of the establishments under this industry. As discussed by Han et al., (2019), the importance of having Loyalty and Rewards Program drives the customer's loyalty towards the business. To effectively gather the data on the customer side, it was suggested by the establishment's Marketing Department to include it in their Raffle Promotion System where an opportunity to gather customer data, which will be used to drive Marketing Analytics and understand the customer behavior when patronizing the establishment and understanding their level of loyalty and how they will be rewarded (Kotler and Keller, 2016). It does not only drive customer loyalty but expresses empathy and understanding to customer wants and needs Pandey (2020). It also included the System Security allowing the User Access Control being implemented to authorize certain access of the features depending on the assigned user roles in the system. It was ensured that the necessary features system was considered and designed and developed to address the said problems raised.

Loyalty and Rewards Scheme Management

Loyalty and Rewards Program Management has been a constant challenge in implementation with big retail industries due to the hesitation to adapt to new technologies and migrate existing legacy systems to new ones. Some companies have been acclimated with the manual or semi-manual process in analyzing and evaluating

the loyalty scores of customers thus leading to misaligned marketing strategies and implementation versus the customer expectation and satisfaction (Lovelock and Wirtz, 2016). Thus, the study proposed to address this concern and look into the advantages in maximizing the power of automation and technology through Data Analytics and Near-Field Communication technology.

The proposed system is centered in understanding the Customer Loyalty and Rewards to properly address and manage the customer expectations and experience. It was developed as a web application using PHP, Asynchronous Javascripting and MariaDB for database management. It implemented the Model-View-Controller (MVC) Architecture where it excels in ensuring the efficient and fast data exchange from Front-End and Back-end with the use of managed stored procedures and functions. All of the calculations and evaluations are done on the server-side, which includes the implementation of the K-Means Clustering Algorithm to evaluate and group together customer loyalty scores according to the Recency, Frequency and Monetary (RFM) Rating compared with other customers and assign a realistic Net Promoter Score (NPS) which will equate to their actual Loyalty and Rewards Score especially considering the large data set it will deal with effective computational needs (Charalambides, Moustaghfir & Senn, 2019).

The Loyalty and Rewards Program Management feature provides two separate access for different user roles: Administrator and Customer. The Administrator has a universal access to the Customer Loyalty Data, as shown on Figure 18, which they can use to interpret and understand the market basket of the company. This will allow the management, like the Marketing, Operations and Leasing, to come up with better rewards and services for the loyal customers to enjoy their perks in patronizing the establishment. On the other hand, the Customer User Role, as shown on Figure 13, provides the loyalty member customers to view their loyalty scores and appreciate their customer buying powers leading them to enjoy the perks they can get from being part of the Loyalty and Rewards Program of the establishment. This feature is available along with the other feature which is the Raffle Promotion System where customers have an option to check their Loyalty standing and score compared to other customers and patrons of the mall.

As shown in Table 1, it was validated that the customers who participated in the study highly appreciated the implementation of the system allowing them to understand how the loyalty and rewards system work for the establishment and the privilege they can get from increasing their loyalty scores (Lovelock and Wirtz, 2016).

Raffle Promotion System

Gathering the data for customer behavior in terms of buying power, loyalty and patronizing is a challenging task that the management encountered. Manual implementation of marketing strategies to gather these vital data has been implemented but the number of tasks that needs to be prepared, analyzed and executed posed a hurdle to the establishment (Lovelock and Wirtz, 2016). In order to assist and provide efficient and accurate data gathering process, the study provided the feature of the Raffle Promotion System that automates the redemption of raffle entries of the mall's marketing event called Shop and Win. Implementation of this system allowed an opportunity to easily gather customer data with permission from the customers by signing and agreeing with the Data Privacy Act and Disclosure Form which gave them the option to participate or not.

The features of the Raffle Promotion System were allocated to two user roles: Admin and Promotion Staff. The Promotion staff has access to the Customer Registration, as seen on Figure 19, and Redemption of the Raffle Entries, as shown on Figure 20. The said modules allow the Promotion Staff to process registration on the system for customers with or without the existing loyalty card called SM Advantage Card (SMAC) and the proposed NFC-enabled Card for the Loyalty System. The card details are recorded to the system to manage the customer data processed by the system as the customers redeem their purchases within the establishment. The customer data being gathered will be the basis for the calculation of the loyalty score and understanding the customer's buying and patronizing behavior. As seen on the Consolidated Interview Results, as shown on Table 1, it was unanimously agreed by the participants of the interview that the implementation of the proposed NFC-enabled loyalty card is much more efficient and with ease of use compared to the existing magnetic stripe cards (Hendrix, 2019). The raffle redemption module manned by the promotion staff provided efficient and fast processing of raffle entries with the implementation of the proposed NFC-enabled loyalty cards through tapping.

The Administrator access provided the following modules: Mall Information Management for Stores and Store Class, Customer Information Management, System User Management, Raffle Management including the Drawing of Winners, Printing or Reports and Voiding of Raffle Entries. The Mall Information Management module, as shown in Figures 11 and 12, allowed the administrator of the system to create master data on Stores and Store Classes which will be a reference in the Raffle Promotion System. The Customer Information Management, as shown in Figure 8, has the same features with Customer Registration of the User access to provide the management of customer information and registration. The System User Management, allows the provision of access to the system, as seen in Figure 13. Finally, the Raffle Management encompasses the Monitoring of the Raffle Entries redeemed, as shown in Figure 10, where the administrator has the access to filter the redemption by customers using their NFC-enabled loyalty cards, SM Advantage Cards or by non-membership participation. In case where customer changes their mind to void their participation or the promotion staff had erroneous entries, The Raffle Voiding module, as shown on Figure 14, provides access and authorization to the Administrator to override and void the raffle entries inputted into the system. It also provides the access to the Drawing of Winners, as shown on Figure 10, where the Administrator can initiate the drawing of winners based on the plotted Raffle Draw date which happens weekly in the span of two months. Drawing of the raffle entries are done in the presence of the DTI Representative and with the assistance of the mall IT, witnessed and monitored by the Marketing Department. Finally, the printing of the reports and winners, as shown on Figure 15, allows the administrator to produce hard copies of the winners for re-validation and approval of the DTI representative.

The customer and purchase data gathered from the Raffle Promotion System are the ones used to analyze and process with Marketing Analytics using the aforementioned tools and techniques to come up with the most realistic and accurate Loyalty Scoring for each customer who participated.

Marketing Analytics

The data gathered from the Raffle Promotion System will play a vital role in delivering the expected output in understanding Customer Behavior, Demography, and Loyalty.

The purchases of the customers inputted to generate raffle entries are used to evaluate how the customer behaves in terms of purchasing within the establishment. As shown in Figure 18, the Customer Loyalty Information derived from the algorithms used, K-Means Clustering, Net Promoter Score and RFM Rating, are compared with other customer's data and come up with a Loyalty Score for presentation to the Administrator of the system. It provides an overview of the information on Customer's Loyalty, habits and behavior when they shop and purchase with stores in the establishment. It also presents the market basket of the customers who availed both the proposed Loyalty and Rewards program and the existing SM Advantage Card. The calculation of the loyalty scores happens real-time every time a customer redeems a raffle entry. This is the trigger for the real-time calculation to ensure that the customer and the management are always up-to-date with their loyalty information.

As shown in Figure 17, the customers have a dedicated portal in accessing the loyalty information including their general loyalty score and their broken-down score according to recency, frequency and monetary. This also provide them the information on their most active visits, recent shops purchased with, time and amount of their purchase on a week's average. It allows, not only the customers, but also the management to understand the trend in the purchasing power and activity of their market basket.

Finally, as shown on Figure 16, Customer Feedback Form, provides an overview of the pulse and perception of the customer in terms of the raffle promotion marketing event and the system used to process their raffle entries. This was a special request from the management to include the feedback form which was an opportunity to gather more data to be used in evaluating the Rewards System for loyal and registered customers.

Security

The gathered customer data are of utmost priority for confidentiality as it is covered under Data Privacy Act of

2012. The customers have also signed a document on the disclosure of the information they have shared for educational purposes only. To ensure the security of the system, User Role access has been implemented with authorized access.

The User Information Management, as shown in Figure 13, provides the management of administrator of the system to administer access to users and assign roles for their access. The login credentials of each user are properly hashed and encrypted using MD5 to ensure security upon logging in. All the processing of the authentication in the system is secured with the implementation of MariaDB with built-in security measures from any form of intrusion and malicious access, like SQL Injection and Denial-of-Access (DOS). To further improve the security measures of the system, the implementation of MVC allows all the transport of data from Front-End to Back-End via the use of Stored Procedures and Functions that will hinder any form of hijacks upon authentication on the login.

These security measures were implemented to cover any vulnerabilities that might pose a threat to the information gathered as the customer data used in this study are actual and live information of the establishment.

The presentation of the features of the Near-Field Communication Loyalty Program with Marketing Analytics implies a robust and digitally transformed experience for customers to engage them more and drive customer loyalty and satisfaction equipped with Raffle System Features that will gather and analyze data for marketing campaign purposes. The implementation of the algorithms techniques with Loyalty Scoring provides a better overview and translation how a customer behaves and predicting their buying power.

Thus, it can be concluded that the features of the proposed system are aligned in addressing the concerns and problems raised in this study and was properly necessary features were represented and functional for better customer experience.

The proposed system provided live data of customers in one of the mall's marketing events where a raffle system was used, it was widely received a positive feedback and review as indicated in the Table 2, Table 3 and summarized in Table 4 below. The respondents even showed interest to recommend in widening the scope of implementation of the proposed system and loyalty scheme, as suggested by both mall employee and customer respondents to not be limited to SM City General Santos but nationwide.

Efficiency Level of Near-Field Communication Loyalty Program with Marketing Analytics

Table 4.

User Questionnaire Result – Usability of the System

Indicators	Rating	
	Weighted Mean (Average)	Verbal Interpretation
The system's modules, navigation, and commands can be easily operated	4.7	Very Usable
The system recognizes and processes the use of Near Field Communication (NFC)-enabled rewards and loyalty card used	4.6	Very Usable
The respondent is confident with the information provided by the system	4.6	Very Usable
User-friendly / Ease of use (of the entire system or while doing the transactions)	4.7	Very Usable
The proposed loyalty scheme is properly represented and provided to the user throughout the system	4.6	Very Usable
The proposed loyalty scheme provides real-time results and information	4.7	Very Usable
The proposed loyalty scheme encourages the respondents to	4.7	Very Usable

patronize the mall		
The proposed loyalty scheme should be by the mall as their new loyalty scheme	4.7	Very Usable
TOTAL AVERAGE	4.7	Very Efficient
	-94%	

Table 4 shows the User Questionnaire Results for the Usability category of the system.

Table 5.

User Questionnaire Result – Functionality of the System

Indicators	Rating	
	Weighted Mean (Average)	Verbal Interpretation
The system is stable that no issues were encountered	4.5	Excellent
The system has working calculations and graph generations for its analytics	4.5	Excellent
The system provides meaningful analytics and results as expected by users	4.5	Excellent
The system is properly functioning as a whole	4.6	Excellent
The proposed loyalty scheme successfully processes and represents the purchasing history of respondents	4.5	Excellent
The proposed loyalty scheme has effectively expressed the respondent's purchasing and loyalty behavior according to the implemented Recency, Frequency, Monetary (RFM analysis) scoring analysis tool implemented in the system	4.6	Excellent
The proposed loyalty scheme is properly working and best explains the respondent's loyalty towards the mall	4.6	Excellent
The respondent appreciates the Recency, Frequency, Monetary (RFM) scoring analysis tool in measuring their loyalty to the mall	4.6	Excellent
TOTAL AVERAGE	4.6 -92%	Very Efficient

Table 5 shows the User Questionnaire Results for the Functionality category of the system.

The importance in gauging the efficiency of the proposed system is vital in the study to be considered timely and significant in addressing the problems identified. The efficiency level of the proposed system will be measured according to response time, competency and reports generation.

As indicated in the Interview Results for both Mall Employees and Customer, as shown in Table 1, the participants of the interview unanimously agreed that they did not find any issues with the use and experience of the system. They were able to appreciate the new scheme in calculating the Loyalty Score compared to monetary focused metrics. They were able to experience a breeze redemption and retrieval of their information with the proposed system. As indicated in Table 4, the recognition and processing of the NFC-enabled cards as the new loyalty cards in terms of responsiveness and efficiency had a 4.6 weighted mean which interprets as Very Usable. It was proposed was also appreciated in terms of response time as it efficiently acknowledged the customer information in one tap compared to the existing magnetic stripe reader used by the establishment

which deteriorates over time based on the numerous times it was used with its reader. The contactless use of the NFC-enabled cards was more applauded over the previous one. The acceptance of the respondents on the use of NFC Technology is supported by Hendrix (2019), which states in his study that customers are more confident and felt secured doing transactions with the use of the said technology.

It was also discussed in the Interview Results by both mall employees and customers, available in Table 1, that even the other competitors like Robinsons Place, KCC Mall of Gensan, Ayala Malls and even 7-11 Convenience Store, have implemented their own Loyalty and Rewards Program, the proposed system implementing the Loyalty and Rewards Program for SM City General Santos has been much more positively received over the other competitors due to the extensive and realistic loyalty scoring which provides better opportunity for customers to gain higher rating. This is supported with the result from Table 4 in terms of loyalty representation and real-time results with weighted mean of 4.6 and 4.7, respectively, interpreting that it is very usable. Not to mention on the marketing side that, the rewards provided by SM City General Santos are much better compared to its competitors. One point that was stressed out about the loyalty privilege or reward is that the exclusivity of the priority lanes for loyal members is more evident in the establishment compared to its competitors. This can be an opportunity for the marketing team to boost and support the privileges and rewards of the loyalty members through the validation and presentation of the Marketing Analytics gathered from the proposed system (Charalambides, et al, 2019). This also supported with the result from Table 3 in terms of translating the customer purchase behavior as loyalty metrics, and properly interprets the expected loyalty scoring for customers with weighted mean of 4.6 for both which translates to excellent.

The reports generation for the proposed system was also highly applauded with its alignment on providing efficiency on both the establishment and the customers of the establishment by understanding the customer behavior and trends in the buying power and purchasing capabilities (Verhoef et al., 2019). It was confirmed on Table 1 that the result from the interview showed total satisfaction and appreciation on the proposed system being implemented especially on one of its marketing promotion events which is a raffle redemption event. The Marketing Department also pointed that without being dependent on the loyalty and rewards report provided by the Head Office, they are able to freely retrieve real-time information to use in their market studies of the target customers for the establishment in order to provide better events, promos and rewards. This is properly supported also on Table 5 in terms of the accuracy on calculation and analytics generation with weighted mean of 4.5 which interprets as Excellent.

The study and the proposed system are implied with high reception results according to Usability and Functionality as discussed with the results. It opens a new opportunity in the business industry to improve their marketing strategies in terms of understanding the customer behavior, loyalty and buying power. With the implementation of Raffle System, it also allows a broader perspective in data gathering, with proper ethical considerations, which will expand the understanding on market size and basket of a business. It was also suggested during the discussion on the implementation of a better alternative for the existing mall loyalty membership card, which is prone to deterioration after a series of swiping from its contact terminal. The researcher then proposed the use of NFC-enabled cards, similar to technology used in the company's employee ID but with bigger radius for detection range. The proposed system and loyalty scheme was openly accepted by the management and decided to implement it on its upcoming Raffle Promotion Event to test and evaluate the efficiency, usability and functionality of the proposed System.

In conclusion, it is highly noted that it addressed the issue of easy deterioration of magnetic stripe membership cards with the proposed replacement NFC-enabled cards which allows contactless detection of customer data from the membership card allowing longer lifespan for cards and lesser times to renew and spend for renewal, except during expiration day thus interpreted with the results from Usability and Functionality of the system.

The respondents of the study recommended the review on the possibility of the proposed system's interoperability with other system in the company or any other available external applications that would require the features of the proposed system to be more dynamic and flexible. It will not only improve the customer experience on enjoying the loyalty and rewards program of the business but also opens new horizons to marketing analytics and understanding customer behavior and purchasing value.

User Acceptance Level of Near-Field Communication with Loyalty Program with Marketing Analytics

The research instrument was used to assess the level of acceptance of the proposed system according to two areas: Usability and Functionality. The rating scale used was from 1 to 5, where 5 interprets to Strongly Agree, 4 interprets to Agree, 3 interprets to Neutral, 2 interprets to Disagree and 1 interprets to Strongly Disagree.

Table 6.

Summary of User Acceptance Test

Indicators	Rating		
	Weighted Mean (Average)	Rating Percentage	Verbal Interpretation
Usability of the System	4.7	94%	Very Efficient
Functionality of the System	4.6	92%	Very Efficient
Overall UAT Rating	4.65	93%	Very Efficient

Table 6 shows that the survey conducted resulted with Usability of the System having a mean rating of 4.7 or 94% rating percentage, which interprets that the participants of the survey see the system to be very efficient on the said area. It shows that the proposed system was user-friendly and easy to use where the system modules, navigation and controls are easily operated. The implementation of the NFC-enabled loyalty and rewards card was also highly accepted as supported with the Interview Results in Table 1 responded by the participating customers. The respondents of the UAT also strongly agree that they are confident in terms with the integrity of data provided by the system and, at the same time, the presentation of the loyalty scheme in the system was highly evident and accessible in real-time. They strongly agree that this encouraged them more to patronize the mall especially when the mall considers adapting the new loyalty scheme and the proposed system (Breugelmans et al, 2020).

Table 6 also shows the survey result for Functionality of the System having a mean rating of 4.5 or 92% rating percentage, which interprets to Very Efficient on the said area. The respondents strongly agreed that the proposed system was properly functioning upon its deployment during the Shop and Win Raffle Event and no issues were encountered. The proposed system has been strongly agreed by the respondents to be working properly in terms of providing meaningful analytics and results based from their purchase and redemption history where calculation of the loyalty score was properly implemented thus providing accurate output for analytics and representation via graphs. With the implementation of the three analytical tools and techniques, K-Means Clustering, RFM Rating and Net Promoter Score, it properly translated the actual customer raw data into meaningful loyalty scores that best describes the customer purchasing behavior (Chaudhuri and Majumder, 2019). This was also validated during the Interview Result on Table 1. As the loyalty score was properly presented by the analytical tools and technique used, the respondents strongly agree that it was effective in translating their actual loyalty to the establishment and greatly appreciates its inclusion in the proposed system.

In summary, the overall UAT Rating of the respondents shown with the mean rating of 4.6 or 93% rating percentage, which translated to very efficient, showed that the two areas: Usability and Functionality was evident and appreciated in the proposed system and loyalty scheme which the respondents highly regard to as essential in properly translating the customer purchasing behavior into loyalty measurement (Chen Huang Liu, 2020). Thus, it can be considered that the results showed a favorable acceptance on study, specifically on the proposed system and loyalty scheme.

This implies that the NFC-enabled Loyalty Program with Marketing Analytics provided four features: Marketing Analytics, Raffle Promotion, Loyalty and Rewards Scheme Management and Security. The proposed system, driven by the Raffle Promotion to gather the customer data, implements a proposed Loyalty and Rewards Scheme with the use of analytical tools and techniques: K-Means Clustering, RFM Rating and

Net Promoter Score, to properly calculate and interpret the customer purchasing behavior into actual loyalty scoring measurement. All the customer data that were analyzed and interpreted as loyalty scores were properly represented with the use of Marketing Analytics concept to provide an overview of the demography, spending habits, time and day of customer activity and even the level of patronizing attitude (Charalambides, et al., 2019).

The proposed system is highly accepted but with the learning curve to be considered to educate the customers in a new experience in Loyalty and Rewards program of the system, it still implies on the necessary trainings for the promotion staff manning the redemption booths, customers who participated in the study and mall employees, specifically staffs from Marketing, Operations and Leasing, who handled the management of the master data in the system were provided in order for them to fully appreciate and experience the benchmarking of the existing system used by the mall versus the one being proposed.

As the results turned into highly positive outcome, it was implied by all that is involved on the study the importance of the proposed system and loyalty scheme in addressing the identified problem in the early phase.

Thus, in conclusion, customers now have the visibility on their purchasing behavior, concrete loyalty score, which they can improve according to the three measures on recency of visits and purchase, frequency of visits and purchase and not just focused on the monetary aspect of the buying power. The mall management now has a real-time visibility on the marketing analytics of the mall and understand what drives the customers to patronize a mall store or establishment allowing them to strategize with effective marketing plans and rewards for loyal customers. Thus, after the methodological process conducted in this study, it is finally concluded that the researcher has addressed all the identified problems and achieved the overall objectives of the study.

Though the proposed system was developed for the intent of academic purposes, the opportunity to use it as a live system on one of the mall's marketing campaigns had provided the study an exposure to a whole new experience and improvements. One of those improvements that the results of the study gave was the recommendation on improvement of the Graphical User Interface (GUI) to enhance the system's aesthetics and attract more customers to register for the loyalty and scheme.

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REFERENCES

1. Acosta, J. A., et al. (2023). Analysis of the determining factors toward the adoption of near field communication (NFC) tag-based fare collection system in the Marikina Heights UV Express Terminal. IEOM Society.
<https://doi.org/10.46254/SA05.20240118>
2. Alex, D. (2024). What is convenience sampling: Definition, method, and examples. Researcher. Life.
<https://researcher.life/blog/article/what-is-convenience-sampling-definition-method-and-examples/>
3. Alnasser, A. H., et al. (2020). Design of loyalty program, information asymmetry, and point expiration policy. *Journal of Retailing and Consumer Services*, 52, 101977.
<https://doi.org/10.1016/j.jretconser.2020.101977>
4. Ambler, S. W., & Lines, M. (2019). Disciplined agile: An alternative to mainstream agile methodologies. *Journal of Systems and Software*, 150, 1–13.
<https://doi.org/10.1016/j.jss.2019.03.041>
5. Bagui, S. S., & Earp, R. W. (2023). Database design using entity relationship diagrams (3rd ed.). CRC Press.
6. Blancaflor, B. J., et al. (2024). Assessing the feasibility and vulnerability of smartphones with NFC as a payment system for restaurants in the Philippines. ResearchGate.
<https://www.researchgate.net/publication/382983866>
7. Breugelmans, E., et al. (2020). The impact of marketing analytics on firm performance. *International Journal of Research in Marketing*, 37(3), 499–518.
8. Calimag, J. E. T., et al. (2020). The impact of using raffle promos toward the buying behavior of senior high school students at Good Samaritan Colleges. Good Samaritan Colleges (Unpublished manuscript).
9. Chandrasekaran, M., et al. (2017). A survey on challenges and opportunities in near-field communication (NFC). *Journal of King Saud University – Computer and Information Sciences*, 32(8), 938–948.
<https://doi.org/10.1016/j.jksuci.2017.10.003>
10. Chaudhuri, S., & Majumder, P. (2019). An application of k-means clustering for customer segmentation in retail industry. *Procedia Computer Science*, 167, 372–381.
<https://doi.org/10.1016/j.procs.2019.12.011>
11. Chokshi, M. (2019). The benefits of near-field communication for retail businesses. CustomerThink.
<https://customerthink.com/the-benefits-of-near-field-communication-for-retail-businesses/>
12. Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage.
13. Creswell, J. W., & Poth, C. N. (2017). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). Sage.
14. Dey, S., et al. (2020). A hybrid approach based on k-means clustering and deep learning for detection of abnormal EEG signals. *Expert Systems with Applications*, 150, 113233.
<https://doi.org/10.1016/j.eswa.2020.03.021>
15. GeeksforGeeks. (n.d.). Use case diagram – Unified Modeling Language (UML).
<https://www.geeksforgeeks.org/system-design/use-case-diagram/>
16. Ha, J., & Jang, S. S. (2018). The influence of restaurant loyalty programs on customers' relationship commitment and intention to spread electronic word-of-mouth. *International Journal of Hospitality Management*, 78, 166–176.
<https://doi.org/10.1016/j.ijhm.2018.08.005>
17. Han, H., et al. (2019). Loyalty programs and customer loyalty: Do customer-loyalty programs really matter? *Journal of Hospitality Marketing & Management*, 28(3), 1–20.
18. Hathaway, T., & Hathaway, A. (2016). Data flow diagrams – simply put! CreateSpace Independent Publishing Platform.
19. Hendrix, T. (2019). 5 benefits of offering NFC loyalty ID. Paytronix.
<https://www.paytronix.com/blog/5-benefits-of-offering-nfc-loyalty-id/>
20. Huang, H., & Zhang, Y. (2021). The impact of NFC mobile payment on consumer shopping behavior. *Journal of Retailing and Consumer Services*, 61, 102542.
21. Kim, H., et al. (2018). Determinants of adoption intention of mobile payment services: Study of Korean consumers. *International Journal of Mobile Communications*, 16(5), 1–18.

22. Kirvan, P., et al. (2025, October 14). What is an entity relationship diagram (ERD)? Tech Target.
23. Kotler, P., & Keller, K. L. (2016). Marketing management (15th ed.). Pearson Education.
24. Kumar, V., et al. (2019). Marketing analytics for data-rich environments. *Journal of Marketing*, 83(1), 97–121.
<https://doi.org/10.1509/jm.15.0413>
25. Kumar, V., et al. (2021). Customer segmentation using machine learning: A systematic literature review. *Journal of Interactive Marketing*, 55, 1–19.
26. Laoyan, S. (2022). What is agile methodology (a beginner's guide). Asana.
<https://asana.com/resources/agile-methodology>
27. Laudon, K. C., & Laudon, J. P. (2020). Management information systems: Managing the digital firm (16th ed.). Pearson.
28. Li, Y., et al. (2021). A hybrid k-means clustering algorithm with fuzzy c-means for gene expression data. *Applied Intelligence*, 51(3), 1–14.
29. Lu, C. S., et al. (2018). The impact of a loyalty program on customer retention. *International Journal of Information Management*, 43, 25–36.
30. Muehfeld, K., & Wang, M. (2022). Intellectual property rights in China: A literature review on the public's perspective. *Frontiers in Sociology*, 7, 793165.
<https://doi.org/10.3389/fsoc.2022.793165>
31. Narwal, P., & Kumar, P. (2019). Examining the moderating role of customer segmentation on the relationship between loyalty programs and customer satisfaction. *Journal of Retailing and Consumer Services*, 52, 102453.
32. Ngai, E. W. T., Lo, C. K. Y., & Ho, T. K. (2021). Marketing analytics: Approaches, methods, and applications. *Journal of Business Research*, 128, 324–336.
33. Palumbo, F., et al. (2015). Near-field communication technology in healthcare: An experimental study for access control and patient monitoring in hospitals. *Journal of Medical Systems*, 39(2), 1–10.
34. Park, J., & Lee, H. (2020). The effectiveness of mobile app-based rewards programs: Focusing on customer perceptions. *Journal of Hospitality Marketing & Management*, 29(6), 1–20.
35. Rivera, J., & Javier, E. (2017). Perception and satisfaction of Filipino shoppers toward retail loyalty cards: A case of the SM Advantage Card. *Journal of Business and Management*, 19(4), 1–12.
36. Santucci, G., et al. (2016). Evaluating the usability of NFC-based ticketing systems in public transportation. *Journal of Ambient Intelligence and Smart Environments*, 8(3), 1–14.
37. Shahzad, A., et al. (2018). Analyzing the influence of airline loyalty program membership on customer spending behavior. *Journal of Air Transport Management*, 71, 1–9.
38. Singh, R., & Pandey, A. (2020). Impact of digital marketing on consumer purchase behavior. *Journal of Retailing and Consumer Services*, 53, 101923.
39. Sommerville, I. (2016). Software engineering (10th ed.). Pearson.
40. Toftegaard, T. S., et al. (2014). A review of NFC for short-range wireless communication. *Proceedings of the 9th International Conference on Broadband, Wireless Computing, Communication and Applications*, 1–6.
41. Verhoef, P. C., et al. (2019). From multichannel retailing to omnichannel retailing: Introduction to the special issue on multichannel retailing. *Journal of Retailing*, 91(2), 174–181.
42. Verhoef, P. C., et al. (2020). Creating customer value through advanced analytics in B2B marketing. *Journal of Business Research*, 121, 1–9.
43. Visa. (2024). Annual Visa consumer payment attitudes study reveals significant decline in cash payments amid rise in cashless transactions. Visa Philippines.
<https://www.visa.com.ph/about-visa/newsroom/press-releases/>
44. Zhang, H., et al. (2018). An image segmentation method based on k-means clustering and local information. *Signal, Image and Video Processing*, 12(4), 1–9.
45. Zhao, L., et al. (2019). Accelerated k-means clustering algorithm based on MapReduce. *Future Generation Computer Systems*, 92, 1–10.

APPENDICES

Appendix A

Interview Guide for Mall Employees and Shoppers

1. What is your experience in using the existing SM Advantage Card Rewards and Loyalty Program?
2. Do you have any issues with the use of the existing Rewards and Loyalty Program?
3. Are there any other malls that uses Rewards and Loyalty Program? Who are they? Who do you think is better in providing you privileges?
4. Is there anything you would like to improve in the existing Rewards and Loyalty Program?
5. How satisfied are you with the existing Rewards and Loyalty program of the mall?

Appendix B

UAT Questionnaire

USER ACCEPTANCE TESTING (UAT) QUESTIONNAIRE

Part I. Respondent's Profile

Name: _____

Part II. User Acceptance Testing

Rating Scale

Scale	Interpretation
5	Strongly Agree
4	Agree
3	Neutral
2	Disagree
1	Strongly Disagree

Rating Scale:

Strongly Agree (5) – complete agreement that the system as a whole is functioning excellently in terms of usability, functionality;

Agree (4) – mostly agree that the system as a whole is functioning well in terms of usability, functionality;

Neutral (3) – somewhat agree that the system as a whole is functioning well and moderately good in terms of usability, functionality;

Disagree (2) – mostly disagree that the system as a whole is functioning fairly in terms of usability, functionality; and

Strongly Disagree (1) – complete agreement that the system as a whole is functioning poorly in terms of usability, functionality;

General Instructions: Kindly encircle the number of your choice based on the rating scale above.

1	The system's modules, navigation, and commands can be easily operated	5	4	3	2	1
2	The system recognizes and processes the use of Near Field Communication (NFC)-enabled rewards and loyalty card used	5	4	3	2	1
3	The respondent is confident with the information provided by the system	5	4	3	2	1
4	User-friendly / Ease of use (of the entire system or while doing the transactions)	5	4	3	2	1
5	The proposed loyalty scheme is properly represented and provided to the user throughout the system	5	4	3	2	1
6	The proposed loyalty scheme provides real-time results and information	5	4	3	2	1
7	The proposed loyalty scheme encourages the respondents to patronize the mall	5	4	3	2	1
8	The proposed loyalty scheme should be by the mall as their new loyalty scheme	5	4	3	2	1

Functionality

1	The system is stable that no issues were encountered	5	4	3	2	1
2	The system has working calculations and graph generations for its analytics	5	4	3	2	1
3	The system provides meaningful analytics and results as expected by users	5	4	3	2	1
4	The system is properly functioning as a whole	5	4	3	2	1
5	The proposed loyalty scheme successfully processes and represents the purchasing history of respondents	5	4	3	2	1
6	The proposed loyalty scheme has effectively expressed the respondent's purchasing and loyalty behavior according to the implemented Recency, Frequency, Monetary (RFM analysis) scoring analysis tool implemented in the system	5	4	3	2	1
7	The proposed loyalty scheme is properly working and best explains the respondent's loyalty towards the mall	5	4	3	2	1
8	The respondent appreciates the Recency, Frequency, Monetary (RFM) scoring analysis tool in measuring their loyalty to the mall	5	4	3	2	1

Comments: (Please state your comments, suggestion and recommendations about the system)

Name and Signature of the System Evaluator

Date of Evaluation

Appendix C

UAT Validation Sheet

Direction: Please rate the validity of the instrument in terms of its content and format. Use the following scale in determining your responses to the different indicators below:

5 - Very High Extent

4 - High Extent

3 - Moderate Extent

2 - Low Extent

1 - Very Low Extent

NO	DESCRIPTION	5	4	3	2	1
1	The instrument will yield true and accurate information on the topics and variables being studied.					
2	The data gathered through the instrument are appropriate and useful in making inferences.					
3	The information collected through the use of the instrument serves the purpose for which it is collected.					
4	The content and format of the instrument appropriately covers the topics and the variables intended to be studied.					
5	The contents/items in the instrument adequately represent the variables being studied.					
6	The content and the format of the instrument are consistent with the variables being studied.					
7	The items contained in the instrument comprise an adequate sample of the content which it is supposed to represent.					
8	Generally, the instrument measures the variables which it intends to measure.					

Other Comments

Validator's Name and Signature

Appendix D

UAT Validation Test Result

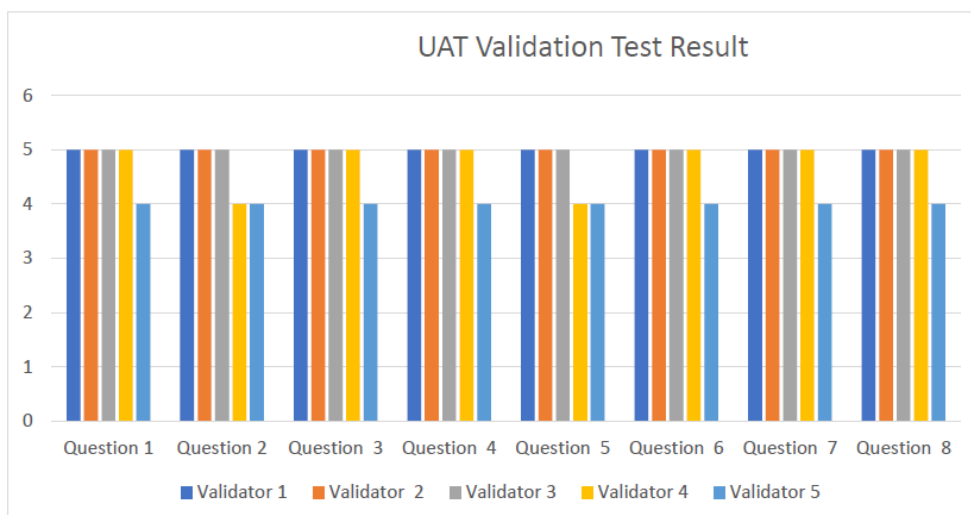


Figure 21. UAT Validation Test Result

Figure 21, as shown above, is the result of the User Acceptance Test Validation conducted by five (5) validators.

APPENDIX E

Loyalty Program with Raffle System and Analytics – A Snapshot

Table 7:

Rewards and Loyalty Program with Raffle System and Analytics - a snapshot	Features
Loyalty and Rewards Scheme Management	Mall Customers Loyalty Assessment, Mall Shoppers List
Raffle Promotion System	Redemption, Drawing of Raffle Entries
Marketing Analytics	Customer Demographic Profiling, Mall Stores Performance Profiling
Security	User Login, Near Field Communication (NFC) Loyalty Membership Cards

Table 7 shows a snapshot of the Rewards and Loyalty Program with Raffle System and Analytics that was designed.

APPENDIX F

Marketing Analytics Report

Table 8.

Marketing Analytics Report

Functional Area	Marketing Analytics
Customer Information Management	Mall Customer Shopping Behavior Statistics, Mall Customer Survey Feedbacks
Mall Store Information Management	Mall Stores Sales and Performance Statistics
Raffle Management	Customer Raffle Entries Summary, Raffle Winners and Backup Winners Report

Table 8 shows a snapshot of the Marketing Analytics Report that was designed.

Appendix G

User Acceptance Test Results

Table 9.

UAT Acceptance Test Results

Respondents		Usability							
		1	2	3	4	5	6	7	8
1		5	4	5	5	4	4	4	5
2		5	5	5	5	5	5	5	5
3		5	5	5	5	5	5	5	5
4		5	4	4	5	4	5	5	4

5		5	5	5	5	5	5	5	5
6		5	5	5	5	5	5	5	5
7		5	5	5	5	5	5	5	5
8		4	4	4	4	4	4	4	4
9		5	5	5	5	5	5	5	5
10		5	5	5	5	5	5	5	5
11		5	5	5	5	5	5	5	5
12		5	5	4	5	5	5	5	5
13		5	5	5	5	5	5	5	5
14		5	5	5	5	5	5	5	5
15		4	4	4	4	4	4	4	4
16		5	5	5	5	5	5	5	5
17		5	5	5	5	5	5	5	5
18		5	5	5	5	5	5	5	5
19		5	4	5	5	4	4	5	5
20		4	5	5	5	5	5	5	4
21		5	5	5	5	5	5	5	5
22		5	5	4	5	4	4	5	4
23		5	5	5	5	5	5	5	5
24		4	4	5	5	4	5	5	5
25		4	4	4	4	4	4	4	4
26		4	4	3	3	3	3	4	4
27		5	5	5	5	5	5	5	5
28		5	5	5	5	5	5	5	5
29		5	5	5	5	5	5	5	5
30		5	5	5	5	5	5	5	5
31		5	2	3	2	4	5	4	5
32		4	3	5	5	4	4	3	5
33		5	4	4	4	4	5	5	5
34		5	5	4	4	5	5	5	5
35		5	5	5	5	5	5	5	5
36		4	4	4	5	5	4	4	4
Respondents		Usability							
		1	2	3	4	5	6	7	8
37		5	5	5	5	5	5	5	5
38		4	4	4	4	5	4	5	4
39		4	4	4	4	4	4	4	4
40		5	5	5	5	5	5	5	5
41		5	5	5	5	5	5	5	5
42		5	5	5	5	5	5	5	5
43		4	4	4	4	4	4	4	4
44		5	5	5	5	5	5	5	5
45		5	5	5	5	5	5	5	5
46		3	4	5	4	4	4	4	5

47		3	4	4	3	5	5	4	3
48		5	5	5	5	5	5	5	5
49		5	5	5	5	5	5	5	5
50		5	5	5	5	5	5	5	5
51		5	5	5	5	5	5	5	4
52		4	4	4	5	5	4	4	4
53		5	5	5	5	5	5	5	5
54		4	3	4	4	3	3	4	4
55		4	4	4	3	4	5	4	5
56		4	4	4	4	4	4	4	4
57		5	5	5	5	5	5	5	5
58		5	5	5	5	4	5	5	5
59		4	3	5	4	3	4	5	4
60		5	5	4	5	5	5	5	5
61		5	5	5	5	5	5	5	5
62		5	5	4	5	5	4	5	5
63		5	5	5	5	5	5	5	5
64		4	4	4	4	4	4	4	4
65		5	5	5	5	5	5	5	5
66		5	5	4	5	5	4	4	5
67		4	4	4	4	4	4	4	4
68		5	4	5	5	4	5	5	5
69		4	4	5	5	5	5	5	4
70		5	5	5	5	5	5	5	5
71		4	4	4	4	4	4	4	4
72		5	5	5	5	5	5	5	5
73		5	5	5	5	5	5	5	5
74		5	5	5	4	5	3	5	5
75		4	5	5	5	4	5	4	5
76		4	4	4	4	4	4	4	4
77		5	4	4	4	4	4	4	5
78		5	5	4	5	4	5	4	4
79		4	4	4	3	4	4	4	4
80		5	5	5	5	5	5	5	5
Respondents		Usability							
		1	2	3	4	5	6	7	8
81		5	5	5	5	5	5	5	5
82		5	5	4	5	5	5	5	5
83		4	4	4	4	4	4	4	5
84		5	4	4	4	4	4	5	5
85		5	5	5	5	5	5	5	5
86		5	5	5	5	5	5	5	5
87		5	5	5	5	4	5	5	5
88		5	5	5	5	5	5	5	5

89		5	5	5	5	5	5	5	5
90		5	5	5	5	5	5	5	5
91		4	5	5	4	5	5	5	5
92		5	5	5	5	5	5	5	5
93		5	5	5	5	5	5	5	5
94		5	5	5	5	5	5	5	5
95		5	5	5	5	5	5	5	5
96		5	5	5	5	5	5	5	5
97		4	5	4	5	4	5	4	5
98		5	5	5	5	5	5	5	5
99		5	5	5	5	4	5	5	5
100		5	5	5	5	5	5	5	5
101		4	4	3	3	4	4	4	5
102		5	5	5	5	5	5	5	5
103		4	4	4	4	4	4	4	4
104		5	5	5	5	5	5	5	5
105		4	5	4	5	5	5	5	5
106		4	4	4	4	4	4	4	4
107		4	4	4	5	5	4	5	4
108		5	5	5	5	5	5	5	5
109		5	5	5	5	5	5	5	5
110		5	5	5	5	5	5	5	5
111		5	5	5	5	5	5	5	5
112		3	5	4	5	3	4	5	4