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COLLEGE OF BUSINESS AND ECONOMICS

MBA PROGRAMME

ANALYTICS OF MOBILE BANKING CUSTOMERS USAGE BEHAVIOR - THE CASE OF COMMERCIAL BANK OF ETHIOPIA

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ANALYTICS OF MOBILE BANKING CUSTOMERS USAGE BEHAVIOR: THE CASE OF COMMERCIAL BANK OF ETHIOPIA

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A thesis submitted to the College of Business and Economics of Addis Ababa University in partial fulfillment of the requirements for the Degree of Master of Business Administration (MBA)

September 2021

Addis Ababa, Ethiopia

DECLARATION

I hereby declare that this MBA thesis, titled Analytics of Mobile Banking Customers Usage Behavior in the Case of Commercial Bank of Ethiopia, is my original work, that it has not been submitted for a degree at any other higher educational institution, and that all sources of material used in this thesis have been properly acknowledged.

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ADVISORS' THESIS SUBMISSION APPROVAL SHEET

This is to certify that the thesis entitled "*analytics of mobile banking customer usage behavior the case of commercial bank of Ethiopia***"** has been carried out by Habtamu Mulatu /Gse/7462/11 under my supervision. Therefore, I recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the department for defense.

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EXAMINERS' THESIS APPROVAL SHEET

We, the undersigned members of the Board of Examiners for Habtamu Mulatu's final open defense, have studied and analyzed his thesis, " Analytics of mobile banking consumers usage behavior in the case of a commercial bank in Ethiopia," as well as the candidate's oral presentation. As a result, this is to verify that the thesis has been approved in partial fulfillment of the Master of Business Administration in Management degree requirement with _____ corrections.

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ACRONYMS

CBE: Commercial Bank of Ethiopia

MB: Mobile banking

MIS: Management Information System.

Abstract

Commercial bank of Ethiopia is making efforts to create awareness and usage of mobile banking services few people are using the facility given by the bank Only a few kinds of research have been conducted in these areas. Research should be conduct to solve the problems. The main objective of this study is to make analytics of the mobile banking customer usage behavior in the commercial bank of Ethiopia. The study was conducted by using a descriptive type of study based on a quantitative approach to analyze mobile banking customers' usage behavior. The population of interest in this study comprising of mobile banking customers in the commercial banks of Ethiopia. The study was carried out using system-derived secondary data. The analysis of the system-derived data was done with help of tableau desktop software. The overall results were revealed that analytics of mobile banking customer usage behavior has a significant role for a commercial bank in Ethiopia to draw hidden insight and to aid decision making. The researcher made exploratory and descriptive analyses were performed on the available data set. The study recommended banks maximize extensive use of data to make data-driven decisions making.

Keywords: Analytics, Customer, usage behavior, mobile banking, Commercial bank of Ethiopia.

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Technology has been seen as a change agent in the world. A positive movement has been seen among the Ethiopian people for mobile and internet banking. Mobile banking refers to the delivery and use of banking financial services with the help of mobile phones. Tiwari and Buse (2007) The launch of Mobile banking in Ethiopia has increased the growth of transactions through the phone. Mobile banking provides the facility of round-the-clock and eases to use which has attracted a large number of people. Mobile banking provides the facility of payment and accounting system that enhances the speed of delivering banking services. People are very busy and with the mobile statement of the account, long queues to deposit and withdraw the cash are not seen in banks.

Mobile banking is also popular with the name M-banking. It is PDA (Personal Digital Assistant) which provide the facility of performing banking transaction like balance check, payments, and account transaction with the help of the mobile device. Year's back SMS was used to provide mobile banking services but in 1999 first European banks started providing banking is spreading like a virus among the customers due to an increase in the number of mobile subscribers. Mobile phones are still having a potential market to work, they are not able to provide the time for unproductive work. Nowadays several people standing to get the mobile banking platform to the customer with the help of a smartphone with WAP. Mobile banking has given ease to the customer that has reduced the footfall of the customer in banks by performing the transaction easily by sitting at their place or office. The majority of the banks provide various informative services like balance inquiry, check issue, transaction history, and payment stop, etc.

Mobile banking is becoming more popular as a result of its cost-effectiveness and ability to save customer time. It decreases the risk of fraud and allows customers to access their accounts 24 hours a day, seven days a week. Mobile banking is advantageous to both the user and the bank. It lowers the cost of telebanking and allows the bank to communicate with account holders. It also gives banks a place to promote their products and services, such as insurance, mutual funds, and loans. The banking industry in Ethiopia is working to raise

knowledge and use of mobile banking, but only a few people are taking advantage of the service.

The low number of users can be attributed to a variety of factors, including lack of acceptance, service limitations, and non-replication of services in several languages in Ethiopia. To provide mobile banking services, the banking industry has developed the USSD (Unstructured Supplementary Service Data) approach.

It's a menu-based banking system in which the user accesses services by recalling or dialing a phone number. Although the industry has used new ways, user acceptance and usage have yet to reach critical mass. The bank employs a variety of innovative strategies to retain customers and exceed their expectations. The customer's expectations and attitude shifted as a result of this.

1.2. Background of the Organization

Ethiopia's commercial bank was created in 1942 as the country's governmental bank. According to the website, the Commercial Bank of Ethiopia was created as a shared business in 1963 and merged with the privately named Addis Ababa bank in 1974. Since then, it has played an important part in the country's development. As of December 31, 2020, CBE had more than 27.5 million account holders, 4.6 million mobile banking subscribers, and 303.6 billion birrs in assets. Since 2013, the behavior of mobile banking users has not been studied.

The research finding is significant to the commercial banks of Ethiopia organizations in general. The findings of the research assist top management in solving the practical problem of mobile banking in the commercial bank, as well as the area of mobile banking and analytics of customer usage behavior in the commercial bank of Ethiopia in reviewing the way of monitoring and evaluating the bank sector's monitoring and evaluation system. It's also designed to instill a proactive attitude toward customers' usage patterns, allowing them to recognize the major influencing elements and the measures they need to take. The study also serves as a starting point for other academics to conduct future research in the fields of data analytics and mobile banking in Ethiopian commercial banks.

1.3. The Statement of Research Problem

There are two types of research problem those which relates to the state of nature and those which relates to the relationship between variables (Kothari, 2004) in this research the statement of the problem is that relates to nature stated as follows: - Commercial bank of Ethiopia has exerted enormous effort on making awareness of mobile banking services, but the attitude of customers is still lower than expected and insignificant compared to the entire account holders. Moreover, analytics of the existing mobile banking customers' usage behavior has not been studied. For example, the total mobile banking registered stood 4.6 million out of 27.5million account holders as of December 2020. This amount accounts for only 16.72 % of all bank customers. According to digital 2020, 46 million mobile phone subscribers registered as of December 2020, only10% of mobile subscribers are utilizing the service. The bank had planned that it would be able to utilize the potential market at the maximum. Even though mobile banking services covered only 16.72% of the total account holders, but the bank needs to make insight discovery or analytics of the existing mobile banking customers' usage behavior. Thus, this study focused on filling the gap by answering the following research questions: -

1.4. Research Questions

1. On which date, month, and year do customers transfer money maximum and minimum by using mobile banking technology?
2. What is the extracted information derived from existing customers' data?
3. What is the extent mobile banking customer usage pattern varies?
4. What is the trend of customers on each date of the consecutive year?
5. Which type of gender more practiced mobile banking transactions?
6. Which districts have maximum and minimum customer transactions?
7. What is the maximum and minimum amount of money customers transfer through mobile banking?

1.5. Objectives of the Study

This study has the following general and specific objectives

1.5.1. General Objective

The general objective of this study is to make data analytics of mobile banking customers usage behavior in the Commercial Bank of Ethiopia

1.5.2. Specific Objectives

1. To analyze the date, month, and year that customers transfer money through mobile banking in the commercial bank of Ethiopia.
2. To derive insightful information from customers' data in the Commercial Bank of Ethiopia.
3. To investigate the usage patterns of mobile banking customers at CBE.
4. To analyze the trend of each date of the consecutive years
5. To compare and contrast mobile banking customers based on their gender.
6. To make a comparison between districts of commercial banks of Ethiopia.
7. To know the range of amounts that customers transfer by using mobile banking

1.6. Scope of the Study

The conclusions were drawn based on the data analyzed from the mobile banking customer in a commercial bank in Ethiopia. The study is delimited to the commercial bank of Ethiopia. This study will provide new insight into data analytics of mobile banking customers' usage behavior. The research covered only from 2016-2020G.C.

1.7. Limitations of the Study

1. The study was carried out on customers found in the Commercial bank of Ethiopia only so that the research may not reflect the usage behavior of all bank customers.
2. The behavior of the customer may change in the future.
3. The capacity of a PC is low and slow speed to process the transaction data.

1.8. Significance of the Study

The findings of the study are noteworthy for Ethiopian commercial banks in general. The findings of the study aid top management in making data-driven decisions, gaining a more comprehensive view of customer needs and providing better service to customers, creating a customer behavior profile, solving the practical problem of mobile banking in commercial banks, and advancing the field of mobile banking innovations in Ethiopian commercial banks. This research conclusion might be quite useful in an ad campaign. It also aids the bank in reviewing the banking sector's monitoring and evaluation mechanism. Furthermore, it has an important contribution for the government policymakers.

Last but not least this study also helps other researchers as a standing point to do further research in the areas of mobile banking and data analytics of customers in the commercial bank of Ethiopia

1.9. Organization of the Study

The research study was broken down into five sections. The first chapter examined the study's background, the organization's background, the research challenge, the objectives, the scope, and the importance of the study. The second chapter dealt with a study of related literature on research challenges and concepts, with a focus on how they apply to the analytics of mobile banking users in Ethiopian commercial banks. The research approach was addressed in the third chapter. The fourth chapter dealt with the display, analysis, and discussion of data. The fifth chapter included a summary of the findings, conclusions, recommendations, and research ideas.

CHAPTER TWO

LITERATURE REVIEW

2.1. Back Ground of Mobile Banking Technology in the Banking Industry

The banks come up with the concept of mobile banking that is attracting many people in developed and developing countries. The ratio between the mobile user and mobile banking user is very less. The numbers of mobile users are more than that of bank facility users. It allows the banks to take the advantage of the mobile user and make them adaptive towards mobile banking. It provides the facility of operating the banking transaction from the home as well as from an office. Internet banking requires a personal computer and an internet connection, which acted as constraints. Mobile banking solved the problem of internet banking and it comes up with the motto to satisfy the need of customers. It provides the service anytime, anywhere that rules internet banking. Lack of awareness among the people, associated cost, and lack of accessibility have led to a very low number of mobile banking users. Cashless banking is explained as the execution of the transaction with the help of a debit card, credit card, or electronic payment method. It helps the economy in many prospects like removable of black money and complete advantage of welfare program as the money is transferred in the account of the beneficiary. It has given transparency in performing the transaction and even the flow tracked by the user and government. The researcher has emphasized finding the level of awareness in customers and identified the ways through which more awareness is created.

The literature will shed light on the future of client attitudes regarding mobile banking. According to Al-Ashban and Burney (2001), demographic variables have an impact on attitudes and other elements such as technology motivation and behavior when it comes to banking technology.

According to this idea, a study conducted by Sathye (1999) in Australia looked at the elements that influenced the uptake of online banking services and found that awareness was a major determinant. The researchers concluded that the more data a consumer had, the more inclined they were to use internet banking services. Furthermore. potential technology adopters that are willing to try out new ideas

The literature will light on the prospects of the attitude of customers towards mobile banking. Al-Ashban and Burney (2001) study found that demographic variables have an impact on attitude and several other factors like technology motivation and behavior towards banking technology.

In line with this theory research conducted by Sathye (1999) analyzing the factors that affected online banking in Australia indicated that awareness played a key role in influencing the adoption of these services. The conclusion made was that the greater the customer's data more likely they were to adopt internet banking services. Furthermore. In a study conducted by Suoranta (2003), it was discovered that reliability played a significant role for consumers in Finland and that this affected clients of cell phone banking services. As a result, it appears that potential adopters of technology who have the opportunity to experiment with new ideas are more likely to do so, as Rogers claims (1995).

Laukkanen's (2007) research in Finland indicated that convenience and efficiency were the most important elements influencing the adoption of these banking channels when comparing user perceptions of internet banking and cell phone banking. Carlson and Walden (2002) drew similar outcomes from their research in Finland Slow service speed was discovered to be a hindrance to e-commerce.

People are adopting and using mobile banking services, according to the report, because it is highly convenient for the user to conduct banking transactions via mobile phone. Rejikumar and Ravindran (2012) discovered characteristics that influence how early adopters of mobile banking services make decisions. The survey discovered that consumer satisfaction has increased as a result of innovation and current technology. The quality of the bank's services has improved as a result of technological advancements. The demographic, attitudinal, and behavioral aspects of mobile bank users were explored in Bhatt and Bhatt's (2013) study.

According to his research, the most essential component that drove customers' attitudes was updated user-friendly technology of infrastructural amenities and its availability. The banking landscape is shifting away from traditional brick-and-mortar offices and toward mobile Chandran (2004). Mobile banking facilitates financial transactions while also providing convenience at a reasonable cost. When mobile banking reaches people in rural and distant places where banks are absent, growth and changes are evident.

Chuchuen (2016) looked at the relationship between mobile banking intention and adoption, which refers to consumer happiness, and discovered that customers have high expectations of mobile banks.

2.2. Mobile Banking Evolution in Ethiopia

The banking sector's deployment of mobile technologies aided the sector's expansion. Ethiopia was one of the first countries to accept mobile telephony. The popularity of mobile connectivity has given the banking industry a foothold on which to conduct numerous financial activities. In the banking industry, the employment of technology-oriented financial services is not a new notion. Ethiopia's Commercial Bank created and installed its first ATM in 2001, and introduced the Gardachew service (2010). The banking sector has been expanding and becoming more powerful as a result of ongoing reforms. In the last two decades, it has given a wide range of financial services to its customers.

In the year 2013, Ethiopia saw the introduction of innovative bank mobile (mobile banking) concepts. CBE was the first bank to offer mobile banking, and other private banks followed suit subsequently. People have begun to use self-services as a result of technological advancements, which have altered the financial industry's landscape. In other words, mobile banking is defined as a service that connects the consumer and the bank. Customers that utilize a handheld device to conduct banking transactions benefit from mobile banking. They can do a variety of tasks, including bill payment, loan repayment, installment payments, purchasing, and so on.

It is next-generation banking, in which everyone has access to financial services. In comparison to banks, the user believes that mobile banking provides better services. M-commerce, which became popular in 2016, is being integrated by banks. The network service provider is responsible for mobile banking. A transaction would be successful if the internet's speed was maintained. Ethiopia's government has been motivated to provide clients mobile banking services. As a result, the current research demonstrates that automation has a significant impact on human lives.

Every human being's lifeline is their mobile phone. To us, mobile phones are like shadows, and mobile banking is the replacement channel.

2.3. Customer Usage Behavior

The demographic, attitudinal, and behavioral aspects of mobile bank users were explored in Bhatt and Bhatt's (2013) study. According to his research, the most essential component that drove customers' attitudes was updated user-friendly technology of infrastructural amenities and its availability.

There is a significant gap between user and mobile banking, according to Ashta (2003). wang, Y. (2003). The majority of people prefer to do their banking in the traditional way rather than using mobile banking.

Relative advantage, compatibility, complexity, observability, and trainability are some of them. These characteristics have been discovered to be the most important influences on customer behavior. Brown and Alemayehu (2005) conducted research comparing Internet and cell phone banking users and discovered that the most important difference between the two was reliability.

This suggested that there was a lesser chance of a lack of comprehension about cell phone banking at the time of the study. According to this idea, Sathye (1999) performed a study on the elements that influenced internet banking in Australia. indicated that awareness played a key role in influencing the adoption of these services. The conclusion made was that the greater the awareness of customers the more likely they were to adopt internet banking services.

Furthermore, Suoranta (2003) found that reliability was a crucial factor for clients in Finland when it came to adopting cell phone banking services. As a result, it appears that potential adopters of technology who have the opportunity to experiment with new ideas are more likely to do so, as Rogers claims (1995).

Fishbein and Ajzen (1975), seminal theorists, defined attitude as one's favorable or negative propensity toward behavior in a given environment. As a result, one's attitude is inextricably linked to one's behavioral intentions. For example, a person is more likely to have a predisposition to certain diseases.

The technological advancements era, often known as technology revolutions, has a tremendous impact on human existence in general and in the workplace. Millions of people

have been affected by the expansion of IT (information technology). Rapid technology breakthroughs have resulted in significant changes in the global economy and corporate environment. The mindset that develops after using the mobile banking service is influenced by prior experience as well as technological advancements. K.steward and Bradley (2002). Users are eager to adopt mobile banking, according to Patel (2013), however, they are concerned about password security, Privacy, data encryption, and hacking are all issues that need to be addressed. Mobile banking necessitates customer participation. The financial service provider has rapidly accepted the move because it makes it easier and more viable to engage with customers. According to Singh and Sinha's (2016) study, the banking industry has instilled in customers a sense of alertness and recognition for the bank's services. It also represents the evolution and novelty of banking services. It's a different way of doing business than the standard way. Sharma and Singh (2011) acknowledged that customers encounter several issues, including security, the bank's service standard, and mobile banking in using mobile banking in the Commercial Bank of Ethiopia

2.4. Empirical Literature

This section looked at empirical studies on data analytics of mobile banking clients' usage patterns. Several related investigations are being carried out by various researchers in various parts of the world. The survey of more than 3000 corporate leaders, managers, and analysts from firms all around the world was performed by (S. Lavalle,2011; E. Lesser et al,2011). The survey collected data from 108 countries and over 30 industries and organizations of all sizes. According to the report, organization managers or executives do not understand how to use analytics to better their business, this data is not the main barrier.

Executives also want improved ways to communicate complicated insights so they can swiftly grasp the meaning of the data and take action, according to the survey. Executives should concentrate on augmenting traditional historical reporting with new techniques that bring data to life. Data visualization, text and speech analytic, social media analysis, and other prediction techniques are among them. These tools can make it easier to understand and act on insight at all levels of a company. They convert numbers into knowledge and insights that may be used right away.

Organizations should embed insights to derive actions and deliver value, according to a similar study performed by MIT management review and IBM institute for business value in

2011. To be competitive in the market, businesses should employ business information and analytics inside their industry. The study also discovered that firms are tempted to begin their analysis by acquiring all accessible data. This leads to an overarching focus on data management, such as collecting, cleansing, and converting data, which leaves little time, energy, or resource to explore its potential uses. to decision-makers and managers

Instead, organizations should begin implementing analytics in what may appear to be the middle of the process, by first defining the insights and questions required to meet business objectives, and then identifying the data required to answer those questions, so that organizations within each opportunity begin with the question, not the data. Data is described as the lifeblood of decision-making and the raw material for accountability by (K.Vassakis et al,2012). Designing, monitoring, and assessing effective policies becomes nearly impossible without high-quality data that provides the correct information on the right things at the right time.

2.5. Data characteristics

Despite the importance of other characteristics, it is clear from the various big data definitions that size is the dominant characteristic. The five V's reflect big data's expanding popularity. The initial V stands for volume, which refers to the amount of data generated (Grover and Kar, 2017). The second V stands for velocity (big data timeliness), as all data collecting and analysis should be completed as quickly as possible (Chen, M., Mao, S. and Liu, Y., 2014).

The third V stands for variety, as big data is available in several formats and structures, including ERP data, emails, and tweets, as well as audio and video (Russom, 2011; Elragal, 2014; Watson, 2014; Watson, 2019). The fourth V alludes to big data's "large value but very low density," which poses serious challenges in extracting value from datasets (Elragal, 2014; Chen et al., 2014; Raghupathi and Raghupathi, 2014). The fifth V stands for veracity, and it raises concerns about big data reliability when the sources are external, as they are in most cases (Addo-Tenkorang and Helo, 2016; Grover and Kar, 2017; Al-Barashdi and Al-Karousi, 2019).

Credibility, the correctness of the data source, and the suitability of the data for the suggested purpose are all factors in veracity (Elragal, A, 2014). To enable insights to emerge from

hidden information and provide value for the business, big data requires the right technological architecture, analytics, and tools, all of which are dependent on the data scale, dispersion, diversity, and velocity (Russom, 2011).

Streaming data, which can be collected in real-time from various websites, is the cutting edge of big data. Several researchers and organizations have discussed the addition of the last V, veracity, in this context. Due to data inconsistency, incompleteness, ambiguity, latency, deception, or approximations, the quality of the data may be good, bad, or undefined. The ability to manage and extract value from data is critical for modern firms seeking competitive advantages. Big data combines technological obstacles with a plethora of potential, making extracting economic value both a task and an opportunity.

This juxtaposes the business and technological components of big data, and demonstrating how big data contributes to organizational goals has become a critical strategy. In this field, research is being done. Manyika et al. (2011) explained how big data can improve decision-making quality by making information clearer and more applicable more frequently, allowing organizations to create and store transactional data in digital form, making it easier for them to gather more precise information about inventories and products, and using sophisticated big data analytics.

2.6. Data Analytics

“The widespread use of data, statistical and quantitative analysis, exploratory, predictive models, and fact-based management to drive decisions and actions,” says Thomas Davenport.

Every manager in today's organization uses analytics differently. Descriptive, predictive, and prescriptive analytics are the three forms of analytics. Descriptive analytics slices and dices data in many ways to depict what happened in the past. Predictive analytics works by recognizing trends in previous data and then using statistics to draw assumptions about what will happen in the future.

Given what could happen and displaying what would happen under various circumstances, predictive analytics is the best option.

With the application of analytics, e-commerce analytics helps firms translate data into insight, resulting in better decision-making for better business outcomes and optimizing revenue and

profitability. Understanding your customers and how to locate more of them is the key to long-term success.

It is defined as "the examination of data to derive hidden insights to enhance decision making" in layman's words.

Analytics is the study of company data using statistical analysis to uncover and understand historical patterns to forecast and enhance business performance in the future is a common application of analytics is a necessary skill for running a successful business of any kind.

The expansion of big data is accelerating, and many businesses are now interested in managing and analyzing data. Organizations seeking to benefit from big data are turning to big data analytics to help them make faster and better decisions, as standard data management approaches and technology make it difficult to evaluate large datasets (Contentious et al., 2015). As a result, the demand for new big data analytics-specific tools and approaches is increasing. The rise of big data has an impact on everything from the data itself to its collection and processing, as well as the decisions derived from it.

Providing big data tools and technologies can aid in controlling the otherwise exponential expansion of network-produced data, as well as enhancing enterprises' ability to scale and gather the essential data to alleviate database performance issues (Elgendy, N. and Elragal, A., 2014). When you open any major scientific or business magazine today, whether online or in print, you'll almost always come across a reference to data science, analytics, big data, or any combination of these terms (Agarwal and Dhar, 2014).

People increasingly strive to collect data as well as comprehend its significance and meaning to apply it in decision-making. The amount of data to be analyzed is large, and it is made up of many sorts. Big data has characteristics such as being "massive, high dimensional, heterogeneous, complicated, unstructured, incomplete, noisy, and erroneous" (Ma et al., 2014), which necessitate modifications in statistical and data analysis methodologies. It's also crucial to comprehend big data's content. Data analytics is the process of using algorithms to examine the content of large amounts of data.

which is used for 1) evaluating data sets and their relationships, 2) identifying previously unknown valid patterns, and 3) discovering significant associations between stored variables

Various big data analyses will be reviewed in this section, beginning with the accessible data analysis methodologies and some of the most common big data analytics suites, and ending with a discussion of many big data platforms. Data analysis approaches are divided into four categories, one of which is descriptive analytics, which will be discussed.

2.6.1. Descriptive analytics

Describes what has happened or what will happen, whereas diagnostic analytics assesses the explanation for what has happened, which necessitates tools for determining the fundamental causes of a problem. Predictive analytics uses statistical models to try to anticipate the most likely future outcomes, whereas prescriptive analytics uses tools like optimization, simulation, business rules, algorithms, and machine learning to explain and predict the future and characterize outcomes (Banerjee et al., 2013; Grover and Kar, 2007).

Distribution of research studies selected for systematic review across industry domains and analytics types, adopted from (Grover and Kar, 2017).

2.6.2. Managerial implications

In today's hyper-competitive marketplace, Big Data is the new capital (Mayer-Schönberger & Cukier, 2013; Satell, 2014); but, as indicated in the suggested methodology, transforming Big Data into a sustainable competitive advantage is difficult. Firms that have yet to reap the benefits of Big Data are encouraged to adopt the recommended framework to identify problems with the technology. To begin, a company should identify a specific process that is linked to the problem. Is the company unable to derive consumer insights from Big Data?

Is it possible that the company is failing to take advantage of hidden insights to improve its adaptability? Second, a company must determine which capital resource (physical, human, or organizational) is obstructing success with Big Data consumer analytics. Managers are also advised to evaluate organizational culture to see if individuals share an ignorance-based rather than a knowledge-based viewpoint (Sammut & Sartawi, 2012). An organization's ignorance-based perspective can be a source of motivation and interest (Smithson, 1985), allowing it to uncover hidden customer insights and improve its adaptability.

Too much reliance on current expertise, on the other hand, can stifle a company's ability to adapt (Teece et al., 1997; Zhou & Li, 2010). As a result, for businesses to benefit from Big

Data, they must have an ignorance-based perspective throughout the enterprise. Even though Big Data has the potential to alter marketing activities, more than half of Big Data projects fail to meet their objectives (Mithas et al., 2013), presenting significant problems for marketers. To begin with, there is a chronic scarcity of consumer data scientists, as marketing departments at business schools have been hesitant to develop curricula that will produce such expertise.

Furthermore, traditional database administration solutions are incapable of dealing with the massive collections and subsets of data generated (MongoDB, 2014). Furthermore, it is unclear to what extent businesses are taking significant action to apply marketing interpretations of Big Data information. Bold strategic decisions based on Big Data knowledge are required to properly realize the potential of consumer analytics.

2.6.3. Big data platforms and tools

There are now multiple big data analytics tools and the study was done by Oussous et al. (2018) showed the importance of carefully choosing the right tool for the circumstances. The choice is dependent on the “nature of datasets (i.e.,

volumes, streams, distribution), the complexity of analytical problems, algorithms and analytical solutions used, systems capabilities, security and privacy issues, the required performance and scalability in addition to the available budget” (ibid).

Popular analytical tools:

1. Qlikview

Qlikview is a business intelligence software from Qlik. It helps its users understand the business in a better way by providing them features like consolidating relevant data from multiple sources, exploring the various associations in the data, enabling social decision making through secure, real-time collaboration, etc.

2. WPS

WPS can use programs written in the language of SAS without the need for translating them into any other language. In this regard, WPS is compatible with the SAS system. WPS is a

language interpreter able to process the language of SAS and produce similar results. It is sometimes used as an alternative to SAS as it is relatively cheaper.

3. MS Excel

Microsoft Excel is a spreadsheet application developed by Microsoft for Microsoft Windows and Mac OS. It features calculation, graphing tools, pivot tables, and a macro programming language called Visual Basic for Applications. It has been a very widely applied spreadsheet for these platforms, especially since version 5 in 1993, and it has replaced Lotus 1-2-3 as the industry standard for spreadsheets. Excel forms part of Microsoft Office.

4. Tableau

Tableau Software is an American computer software company headquartered in Seattle, Washington. It produces a family of interactive data visualization products focused on business intelligence. Tableau offers five main products: Tableau Desktop, Tableau Server, Tableau Online, Tableau Reader, and Tableau Public

SAS

SAS is a software suite that can mine, alter, manage and retrieve data from a variety of sources and perform statistical analysis on it. SAS provides a graphical point-and-click user interface for non-technical users and more advanced options through the SAS programming language. SAS programs have a DATA step, which retrieves and manipulates data, usually creating a SAS data set, and a PROC step, which analyses the data.

- **Apache Mahout**: This is an open-source machine learning software library that can be used for executing algorithms via Map Reduce, a framework for processing large datasets (Eldawy and Mokbel, 2015). Mahout encompasses several Java libraries, ensuring the efficiency of processing large datasets by allowing the application of large-scale machine learning applications and algorithms. It provides an optimized algorithm in which Mahout converts machine learning tasks presented in Java into MapReduce jobs (Acharjya et al., 2016).
- **R:** This is a programming language often used for big data analysis, which offers relatively easy solutions to performing advanced analysis on large data sets via Hadoop. As compared to Mahout, in terms of types and algorithms, R provides a more complete

set of classification models; however, it is limited by its nature as an object-oriented programming language, which can cause problems with memory management compared to other solutions. In many Sarah Al-Shiakhli 31 cases, use in combination with Mahout is thus recommended (Team, R.C., 2000), as R can be used to execute small data exploration while Hadoop/Jaql executes the larger operations.

- **Alteryx**: This tool offers data blending and an advanced analytics platform where analysts can merge internal business processes, third-party tools, and cloud data centers. Also, it allows data analytics utilizing some tools in a single workflow hour Rehman et al., 2016).
- Google Cloud Platform (GCP) is one of the leaders among cloud Application Programming Interfaces (APIs). Even though it was established a few years ago, GCP has realized significant growth since it suits the public cloud services that are based on massive, solid infrastructures. It gives the developer the ability to build a range of programs starting from simple websites to complex worldwide distributed applications. GCP platform contains a set of physical assets (e.g., computers and hard disk drives) and virtual resources (e.g., virtual machine,a.k.a. VMs) hosted in Google's data center around the globe (Challita et al., 2018).
- H2O is an open-source framework offering parallel processing, analytics, math, and machine learning libraries besides data pre-processing and assessment tools. Furthermore, it offers a web-based user interface that eases its use by analysts and statisticians who have limited programming backgrounds. It also provides support for Java, R, Python, and Scala (Landset et al., 2015).
- Micro Strategy provides an integrated big data analytics platform where the data is stored in Hadoop clusters and the users are permitted to access the desktop computer and mobile devices. This tool offers real-time visualization and interactions to implement fast decisions (ur Rehman et al., 2016).
- **Rapid Miner**: is a programming-free data analysis platform. It provides the user with the ability to "design data analysis processes in a plug-and-play fashion by wiring operators". It allows importing operators for various data formats (e.g., Excel, CSV, XML). It prepares a set of operators for massive datasets with further attributes from open data sources which give an advantage of better predictive and descriptive models (Ristoski et al., 2015).
- **Datameer:** Datameer Analytics Solution (DAS) is a business integration platform for Hadoop. It contains data source integration, "an analytics mechanism with a spreadsheet

interface”, designed with analytic functions and visualization to help business users in reports, charts, and dashboards. Datameer can bring data from both structured such as Oracle, IBM DB2, and unstructured sources such as Twitter, Facebook, Linked In, or emails (Di Martino et al., 2014).

- **Microsoft:** Microsoft platform provides predictive analytics capability called SSAS and integrated into the SQL Server. This platform offers "efficiency in Azure’s cloud data source’s integration and deployments as a web service" also, the simplicity of utilizing for data scientists (ur Rehman et al., 2016)

2.6.4. Analytics in banking

The amount of data stored by banks is rapidly increasing and provides opportunities for banks to conduct predictive analytics and enhance their business. The intelligent customer analytics for recognition and exploration (iCARE) solution provides deeper customer insight to satisfy bank-specific business needs and data environment. It also helps to generate insights for active customers based on their transaction behaviors by using big data IBM(2014).

2.6.5. Data Extraction

Is the process of gathering or retrieving many sorts of data from a range of sources, many of which may be unstructured or poorly organized. It allows data to be consolidated, processed and refined before being stored in a centralized location and changed. This location could be on-site, cloud-based, or a combination of both. Data is extracted from one or more sources or systems during data extraction. The extraction process finds and identifies useful data before processing or transforming it.

.Excel is the most basic tool for the management of the screening and data extraction stages of the systematic review process. In this research, the researcher extracted data from an excel column by using a combination of VLOOK UP MATCH and INDEX function

Customer profiling refers to the categorization of consumers based on their factual and transactional characteristics. Customer profiling is a significant tool in customer relationship management (CRM), and data mining techniques can be used to improve customer profiling accuracy because bank customer data is sparse and complex. Customer behavior may be examined using data mining methods to extract patterns from large customer records, and this data can be utilized as a predictive tool for future customer behaviors E.W.T. Ngai, L, xi, and

D.C.K.chau (2009).customer profiling can be done by using tableau public software. customers have profiled interims of their transaction, age, gender, phone codes, district, etc.

Data Insights: A thorough insight gained by an individual or organization as a result of examining data on a specific subject. This in-depth understanding allows firms to make better judgments than they could if they relied solely on gut sense.

Data analytics techniques are used by data analysts in their research, and corporations use them to guide their judgments. It can assist businesses in better understanding their customers, evaluating advertising campaigns, personalizing content, developing content strategies, and developing goods. A derived insight is a consumable piece of data that may be used to make decisions by stakeholders.

2.7 Research Gap

Different researchers discussed above are conducting related studies in various parts of the world. In addition, (S. Lavalle,2011; E. Lesser et al,2011) performed research with a survey of over 3000 business leaders, managers, and analysts from firms all around the world. The survey collected data from 108 countries and over 30 industries and organizations of all sizes. According to the report, organization managers or executives do not understand how to use analytics to better their business, this data is not the main barrier.

Executives also want improved ways to communicate complicated insights so they can swiftly grasp the meaning of the data and take action, according to the survey. In Ethiopia, however, only a few research on mobile banking technology and data have been undertaken. The research on the prospects and constraints of e-banking in Ethiopia was conducted by (Gardachew, 2010). The study looked into the current state of electronic banking in Ethiopia, as well as the primary difficulties and opportunities associated with implementing a mobile banking system. Mathewos(2016) performed research on the factors that influence the uptake of mobile banking services in Ethiopian commercial banks found out that perceived usefulness and perceived ease of use technology have a positive relationship with the adoption of mobile banking. There is a literature gap about the analytics of mobile banking customers' usage behavior so this research has brought knowledge of data analytics of mobile banking customers' usage behavior by exploring the existing customers' data in the commercial bank of Ethiopia.

The dates, months, and years that mobile banking customer data were not studied, important insightful information and usage patterns of customers were not analyzed and studied, and customers data in the bank, districts were not studied, even though they are important, were not studied in these studies. In general, there is a knowledge vacuum about the analytics of mobile banking customers' usage behavior, thus this research has filled that gap by exploring current customers' data in an Ethiopian commercial bank, which is essential in the banking business. As a result, this research aims to fill a research void.

CHAPTER THREE

3. RESEARCH METHODOLOGY AND RESEARCH APPROACH

3.1. Introduction

The study design and methodology utilized to investigate the research problem are discussed in this chapter. Since obtaining the right data from the right source using the right method and analyzing it with the right analytical tool is the most important for the study's success (Kothari, 1990), this section focuses on the study's research design, data collection, data processing, and analysis. Because this was a quantitative study, it was important to use statistical tools to examine the data after it was obtained. Therefore, the collected data was processed using a tableau.

3.2. Research Design

It is a precise blueprint that directs a research endeavor toward its goal. It is a thorough plan of work that must be completed to meet the study objectives (kothir.2004). The researcher employed a descriptive study design as a result of this. Descriptive research studies focus on describing the features of certain individuals or groups of people (Cress well.2014). Because the goal of this study was to examine the behavior of mobile banking clients in the commercial bank of Ethiopia, a quantitative method was used because it was appropriate and suited for the gathering and analysis of secondary system-derived data and to answer the research questions.

3.3. Research Method

There are three categories of research options, according to Creswell (2014)'s book: quantitative, qualitative, and mixed-method. The quantitative research method was used in this study. Any data collection process or data analysis procedure that creates or uses numerical data is sometimes referred to as quantitative (Saunders et al, 2009). As a result, the study used a quantitative data gathering mechanism through system-derived secondary data, which is why quantitative research was chosen for this study. Aside from that, quantitative data analysis was used in the study.

3.4. The Target population of the study.

The term "population" can refer to the entire set of observations (measures) that one wants to conclude about. It refers to the complete group of people, events, or items that are either real or imaginary, as the researcher tries to develop a generalization of the conclusions from the study's findings (Barreiro & Albandoz, 2001).

The researcher has tried to make data analytics of mobile banking customers' usage behavior by using data collected from system-derived secondary data of customers. Thus, the population of the research is people having a bank account and using mobile banking services. The study consisted of the dates, months, years' details, districts, gender, and the transactions of customers, which study the data analytics of mobile banking customers' usage behavior. Analysis was performed on the system-derived data collected. The research was conducted to answer the objectives framed and study the dates, months and years, data insight, usage patterns, trends of date, gender, districts of mobile banking customers, and amounts of money.

3.5. Data Sources and Data collection.

There are many types of data source and collection methods, one of them is a secondary system derived data. We use secondary data if it fulfills these criteria:- the data apply to the period of interest, the data apply to population interest, the units of measurement comparable, if it is possible to go to the source of the data, the cost of data worth acquisition and terms (Kothari,2004).

The researcher chose the secondary data source based on the above criteria to meet the objectives of the study. The study was conducted by collecting data from system-derived secondary data sources. Secondary data was collected from the MIS department of the respective commercial bank.

The methodology adopted for carrying out the study includes examining data that are available on CBE details activity from excel sheets of customers' data hold by CBE. The data needed for the study was the past four years' mobile banking customers data which is from 2016-2020 G.C. Once the detailed data are collected, mobile banking customers' behavior will be examined.

3.6.The Data size, format, and transformation

Data is digital information that is mostly expressed in terms of byte, kilobyte, megabyte, gigabyte, terabyte. In this research, the data size is about 649MB.

The researcher identified which kind of data format was required for data analysis. The relevant information such as the dates, months, and years of transactions was selected from the secondary system derived data, thus, these systems derived data from the MIS department of the bank. After selection and preprocessing of the characteristics of these secondary data were still in several different formats, we transformed them into useful formats. The method used for reducing the complexity and downsizing the data scale to make the data useful for data analysis through data transformation.

3.7. Method of Data processing and Analysis

Data analysis, according to Marshall and Rossman (1999), is the process of giving order, organization, and interpretation to the thesis's mass of acquired data. It entails coding, modifying, and cleaning data to prepare it for processing. The characteristics of the research plan and the type of data acquired will decide the best analytical technique. Zimund et al., et al., et al., et al (2014) .The data collected using secondary sources were sorted and coded then entered into the software. In this research, the mobile banking customers' transaction raw data was processed from D/M/Y to separate dates by nominating each date name, month, and year through calculating software. The processed data was entered into tableau software. Exploratory data analysis. It is visualizing and summarizing the main characteristics of data that will help to explore data so that we can see what stories our data can tell us about itself. In this research, the researcher used descriptive and exploratory data analysis.

Tableau

It is one of the visual data analytics platforms transforming the way we use data to solve problems by empowering people and organizations to make the most of their data. It helps in simplifying raw data in a very easily understandable format. It also provides an optimized, live connector to the SQL server so that we can create charts, reports, and dashboards while working directly with our data. It works with clean and processed data. The researcher used Tableau to analyze the data, since the data is big data tableau is the appropriate tool to analyze such type of data.

3.8. Validity and Reliability

3.8.1. Research validity

Derived from the Latin term validities, meaning “strength,” validity is a term used in both qualitative and quantitative research. It asserts that a finding can never truly be proven; it can only be argued (Trochim, W. 1999). Validity of an instrument is how accurate the instrument is in obtaining the data it intends to collect (Mugenda, 2003), it is also the ability of an instrument to gather data required for the analytic techniques (Binyam, 2016) in this study, the researcher used the system derived secondary data the necessary data was collected by this system no human intervention and the results of the research can give the right answer to the research question thus the research is valid.

3.8.2. Reliability

The following factors, according to C.R.Kothir(2004), can be used to verify the trustworthiness of secondary data: data collector, data sources, suitable techniques, data timing, data accuracy, and compiler unbiasedness. The data was collected by the Ethiopian commercial bank, and the source of data was the bank's customer database. The data was collected using proper software, and the collection time was daily. The researcher desired a high level of accuracy, and since the system compiles the data, there was no bias. The above criteria were examined and confirmed by the researcher. The research is trustworthy.

3.9. Ethical Consideration

To secure customers' privacy, their names and other personal information’s which describe them was not conducted. The data obtained from the bank were confidential. Once the study accomplished the data had and will never be overhanded to anybody else. The obtained data had only been used for this academic purpose.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1. Introduction

This chapter discusses data presentation, data analysis, and data interpretation. A 649 MB of customer data was collected from the commercial bank of Ethiopia. The data was collected, preprocessed, transformed, and analyzed by using tableau public 2021edition. This chapter presents the descriptive analysis of data and the results of the analysis which constitute the main findings of the study. The number of mobile banking customers and the amount of money transferred through mobile banking on each date, each month, and consecutive 4 years have been analyzed. The dates, months, and years also have been analyzed. The range of amounts that customers transfer using mobile banking is also analyzed. The gender of the customers is also analyzed. The districts of the bank have been analyzed.

4.2. The structure of the research data

The methodology section of this document mentioned as a system derived secondary data is collected from the management information system (MIS) department of the commercial bank of Ethiopia. The system captured and retained data of these years Thus, we are lucky to get data of 4 years to analyze detail. A big data that is about 649MB records of data is collected for analysis. Here is the sample of the original data and description column.

4.3. The mobile banking customers original transaction data

As can be shown below the original data contained the amount of money, the date, month, year, and time that the customers do transactions.

Table 1: Mobile banking customer's transaction original data sample

SUM(F.DEBIT_LOCAL_AMOUNT)	BUSINESS_DATE
9,600	09/06/2018 00:00:00
3,000	12/26/2018 00:00:00
1,000	07/06/2018 00:00:00
12,325	11/06/2018 00:00:00
2,600	02/02/2019 00:00:00
10,000	02/04/2019 00:00:00
1,656	11/26/2018 00:00:00
1,500	07/23/2018 00:00:00
500	02/22/2019 00:00:00
1,000	04/12/2018 00:00:00
80,000	01/25/2019 00:00:00
500	12/23/2017 00:00:00
3,750	06/02/2018 00:00:00

It can be seen from the above table; the data initially has three columns. The first column contains the amount of money that customers transfer, the second column contains the date, month, and year. The last column shows the time. This shows that the specific dates, months, and years customers have transferred money by using mobile banking. In this research, we are not interested to know the names of the customer.

4.4. Data transformation

The dates, months, and years values are not detail should be transformed into a detailed format. Thus, we have transformed the data into a refined form.

The first and second original columns are converted into refined form by applying the formula to analysis. Some values such as external user-id times and other values are too detailed, which we believe is not necessary. The following data shows the sample of the transformed data.

Table 2: Customers transformed sample data

Amount	Day	Month	Year
1,800	Mon	5	2019
3,500	Fri	5	2019
40,000	Fri	5	2019
400	Fri	5	2019
100	Fri	5	2019
300	Mon	5	2019
1,000	Mon	5	2019
201	Tue	5	2019
3,000	Tue	5	2019
2,350	Tue	5	2019
2,250	Mon	5	2019
62,000	Mon	4	2019
500	Mon	5	2019
6,000	Mon	5	2019
120,000	Mon	5	2019
10,000	Fri	5	2019
7,000	Fri	5	2019
10,000	Fri	5	2019
600	Fri	5	2019
20,000	Fri	5	2019
2,000	Fri	5	2019

Table 3: Transformed customer data without amount

Day	**Month**	**Year**
Thu	9	2018
Wed	12	2018
Fri	7	2018
Tue	11	2018
Sat	2	2019
Mon	2	2019
Mon	11	2018
Mon	7	2018
Fri	2	2019
Thu	4	2018
Fri	1	2019

The above data sample transformed into the following data that contains columns of years, months, and dates of the mobile banking customer transaction. The rows comprise the number of customers on each date, month, and year.

4.5. The Grand Data

The following grand data shows that the amount of money transferred on each date, each month, and each year which is prepared for analysis. the rows contain the amount of money that customers transfer money and the column shows the year and month that customers used the services.

Table 4: The grand data sample of mobile banking customers

Year	Month	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
2016	July	21,460.00	16,008.00	11,612.00	15,751.00	19,790.00	20,583.00
2016	August	28,006.00	20,979.00	20,176.00	17,112.00	19,334.00	18,974.00
2016	September	20,243.00	15,998.00	21,185.00	23,835.00	21,328.00	19,231.00
2016	October	31,050.00	19,473.00	20,361.00	19,858.00	17,770.00	31,144.00
2016	November	30,340.00	29,014.00	29,782.00	23,348.00	23,515.00	26,459.00
2016	December	33,849.00	23,313.00	20,889.00	25,403.00	27,637.00	33,545.00

4.6. The compressed aggregate data

The grand converted into compressed data so that each sheet of data was made available for analysis each sheet contains millions of customers' data.

Table 5: Worksheet codes

Codes	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
Representation of the code for analysis purpose	Sheet 1	Sheet 2	Sheet 3	Sheet 4	Sheet 5	Sheet 6	Sheet 7	Sheet 8	Sheet 9	Sheet 10	Sheet 11	Sheet 12	Sheet 13	Sheet 14	Sheet 15	Sheet 16	Sheet 17

The collected data are big thus we have compressed each excel sheet of data into columns and rows. From the table below each column shows each sheet of the data which is compressed from the original data that explain transaction dates, months and year of customers. The rows show that the transactions of money each day.

Table 6: The aggregated data sample of mobile banking customers

S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	Total
554	1260	1283	1229	1295	1304	1185	1281	1177	1379	1206	1279	1347	1016	20583
640	1050	1201	1028	1234	1146	1171	1195	1024	1244	1098	1164	1234	982	18974
674	1087	1191	1118	1240	1234	1121	1225	1125	1280	1150	1207	1251	892	19231
624	1746	1970	1798	1991	1945	1872	2064	1796	2026	1880	1963	2046	1566	31144
743	1523	1725	1511	1757	1595	1637	1728	1492	1654	1590	1640	1704	1262	26459
557	1929	2214	1893	2197	2098	2023	2124	1944	2176	2057	2143	2291	1680	33545
936	1345	1461	1239	1496	1535	1331	1457	1298	1549	1333	1407	1470	1132	23232

4.7. Analysis of the Dates

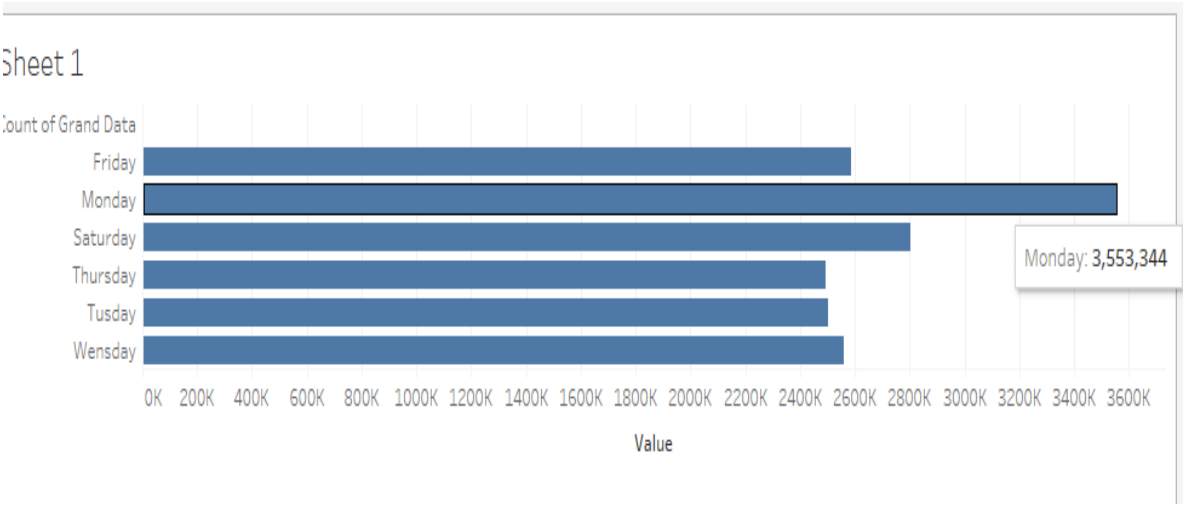
Which dates do many customers transfer money through mobile banking services across the years?

The most popular days for mobile banking customers to transfer money were Monday and Saturday, according to a comprehensive analysis. Many clients have transferred money throughout these 12-month periods over the years. Perhaps one of the reasons for this is because business engagement is at its peak these days, and clients are most active on the first and last days of the week. The inference is that mobile banking-related ad campaigns would be more effective if they were run on these days. The bank should be effective in increasing network capacity.

The days are ranked from lowest to highest in the following histogram, with Thursday, Tuesdays, Wednesday, Friday, Saturday, and Monday being the lowest. According to the rationale offered by MIS department officer Mrs. Bethlehem, the system separately records working dates of the week, thus Sunday has not been separately reviewed.

Note that 1k means 1000.

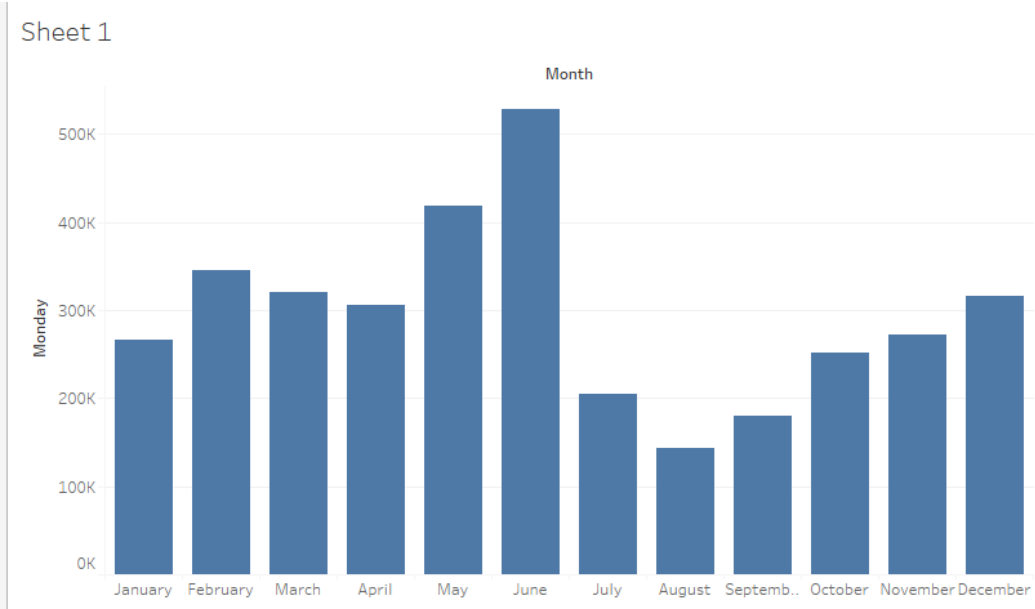
Graph 4.1. the number of customers in a week.



Source own from tableau 2021 ed.

Analysis of each date.

The following graph depicts the analysis report of Monday.



Source own tableau 2021ed

Graph 4.2. number of customers on Monday

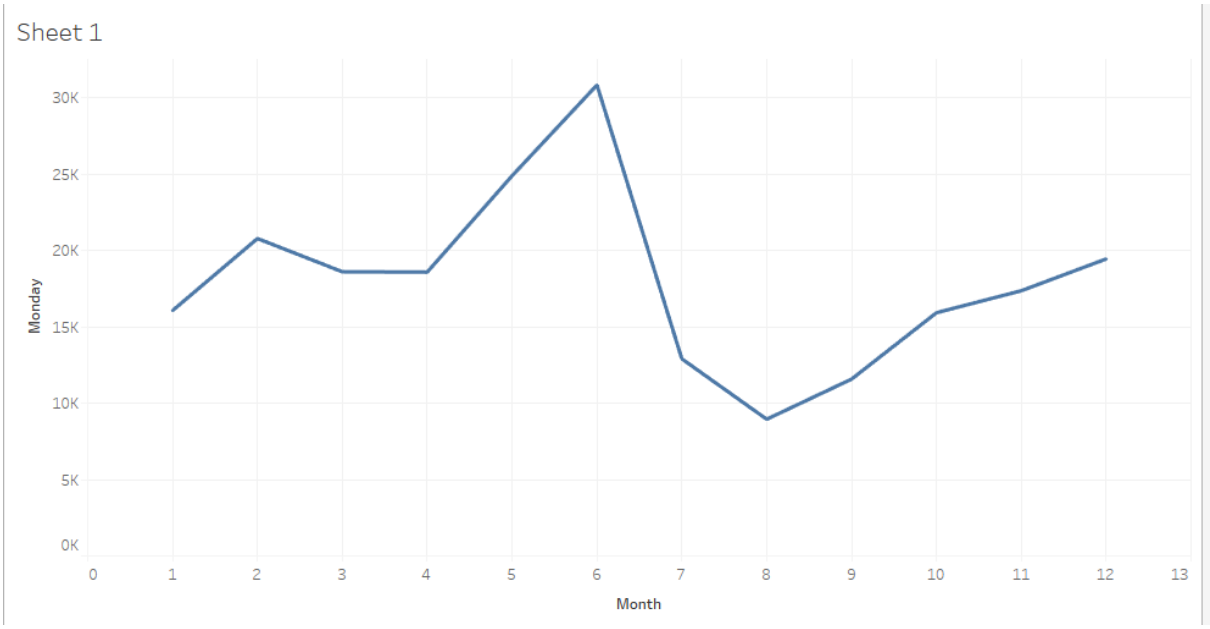
Analysis of Monday

Mobile banking transactions are used by a big number of customers, as shown in the graph above. In January, there were less than 300,000 customers, then more than 300,000 from February to April, more than 400,000 in May, and over 500,000 consumers who use mobile banking services. From July to September, the number of customers was less than 200k, and from October to December, it was more than 200k. The maximum of the year occurs on the first Monday in June. In a similar vein, the number of clients in August is the lowest of all the months.

The consequence is that commercial transactions are greater on Mondays, and they are also higher in June, but they are lowest in August. We may deduce that consumer business transactions are the largest on Monday of all the 6 dates and that many governmental and private purchases and payments are systematically made in June since the fiscal year ends in

June. In a different scenario, the new year budget would not be announced in August, and there would be no purchasing or payment.

Graph 4.3. the pattern of customer usage of mobile banking on Monday.

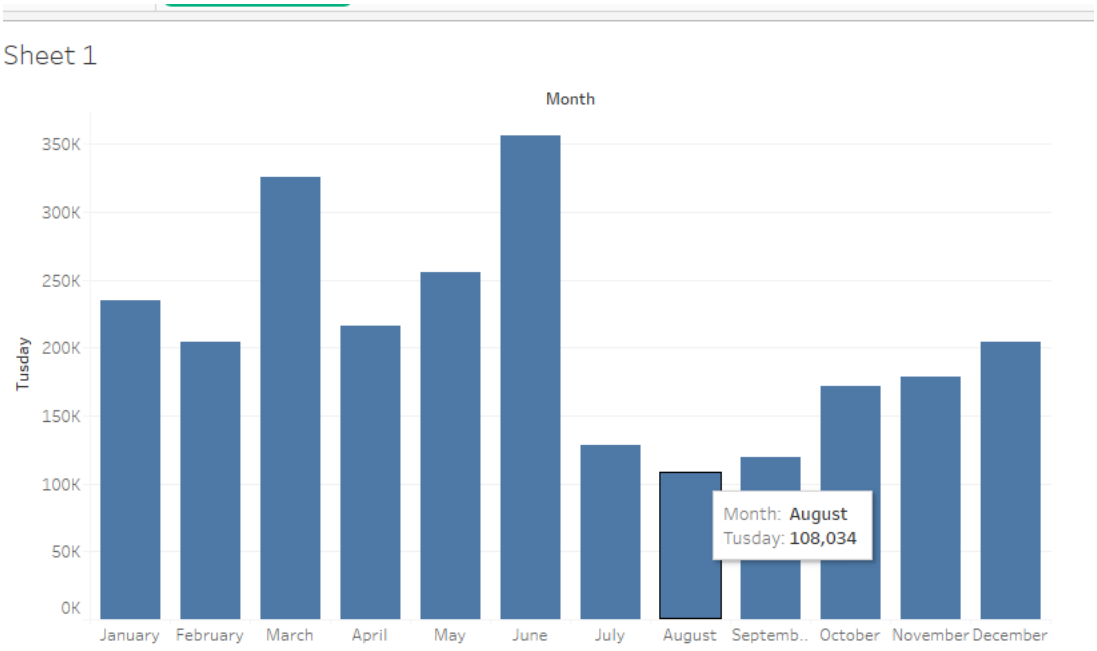


Source own tableau2021ed

On Monday, client patterns were observed.

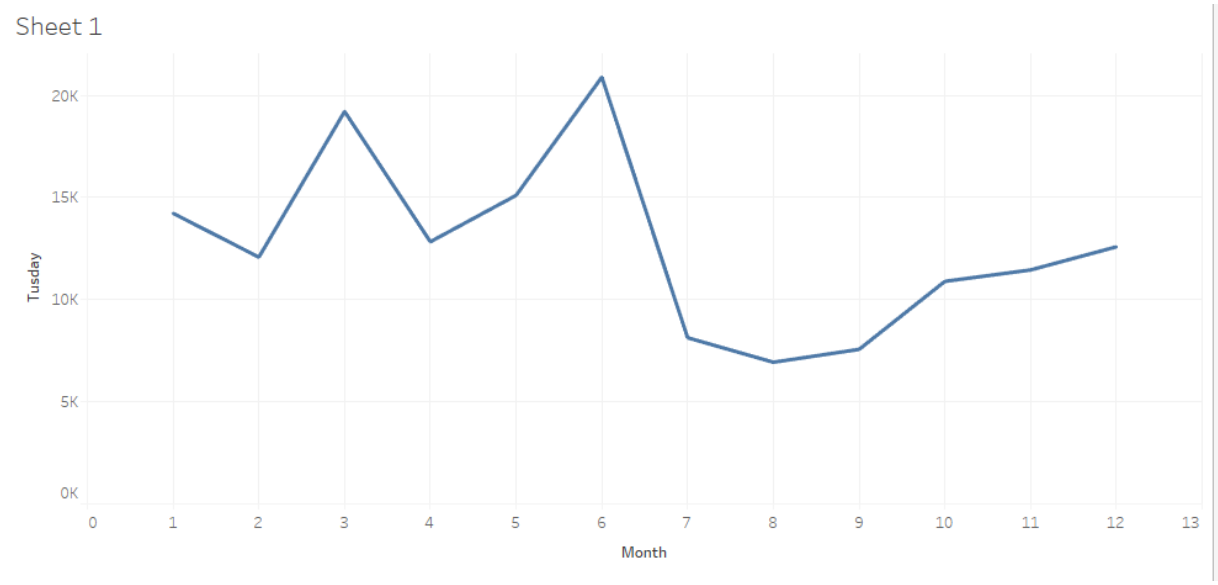
As demonstrated in the graph above, mobile banking users' usage patterns on Mondays increased throughout the year, from January to February, March to June, and September to December. The number of days in July and August decreases from February to March. The conclusion is that there is a diagonal increase in January, April, May, June, September, and October. However, there was a little uptick in March, November, and December. In February, July, and August, on the other hand, the trend slowed.

Graph 4.4. number of customers on Tuesday



Source own tableau 2021ed

Graph4.5. the usage patterns of customers on Tuesday



Source own tableau 2021ed

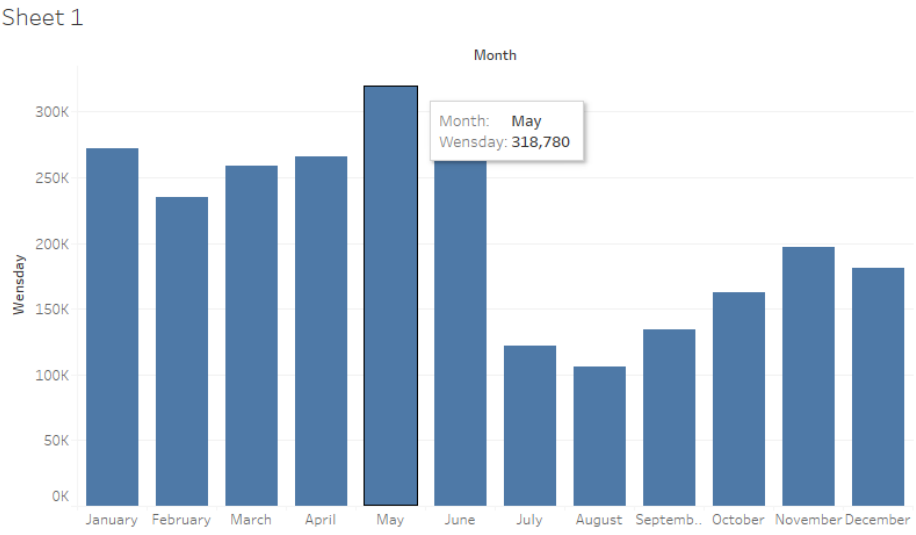
Analysis of Tuesday

From the above graph, in January, the number of customers was above 200k or 200000, less than 200k in February, greater than 300k in March, greater than 200k in April, greater than 250k in May, greater than 350k in June, which is the maximum, less than 150k from July to September, which is the least number of customers the bank, and finally greater than 350k in June, which is the maximum. As a result, May has the highest level of business interaction of all the months. This month, all government purchases and payments are made. As a result, it's a good sign that the bank will continue to follow up and promote itself.

A comprehensive review of the data in the graph above reveals that Tuesday transactions are highest in May throughout the year. The only difference from Monday is this. As a result, May has the highest level of business interaction of all the months. This month, all government purchases and payments are made.

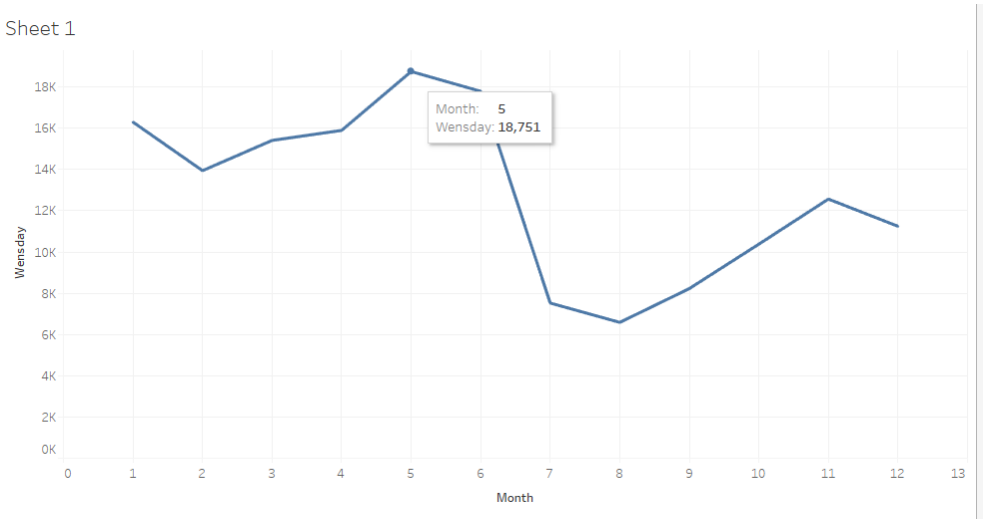
Graph 4.6. the number of customers on Wednesday in the 12 months.

Source own tableau 2021ed



Source own tableau 2021ed

Graph 4.7. the usage patterns of customers on Wednesday.



Analysis of Wednesday

As can be seen from the above figure the transaction on Wednesday of the 12 months in January was greater than 250k, less than 250k in February, greater than 250k in March greater than 300k that as maximum in May and June less or equal to 150k from July – September minimum in August and greater or equal to 150k from October-December that is similar to the previous dates.

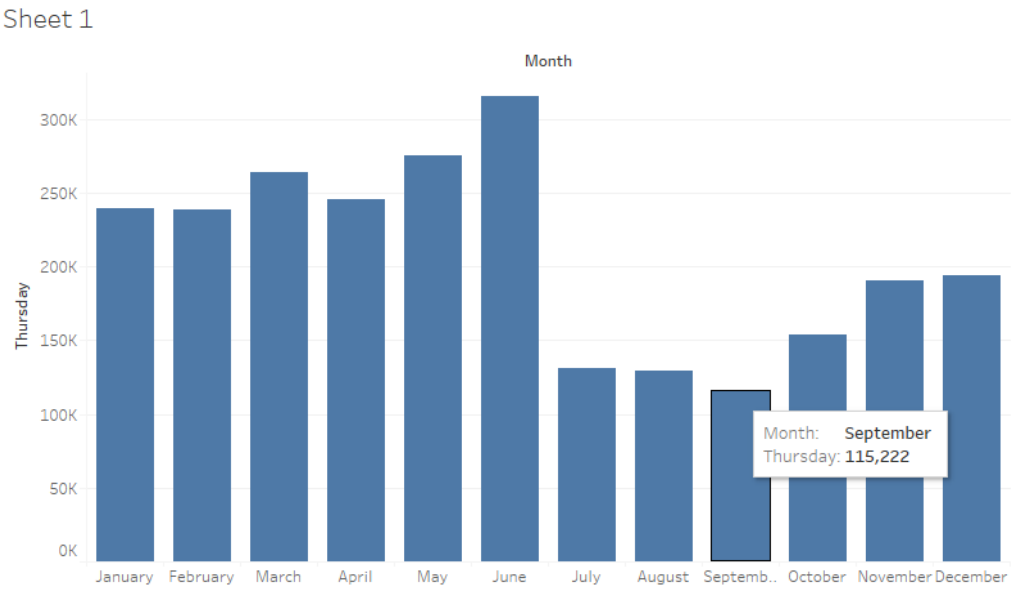
Patterns of customers on Wednesday

According to the graph above, the number of clients climbed in January, declined in February, increased from March to May and June, decreased from July to August, increased from September to November, and decreased somewhat in December.

Analysis of Thursday

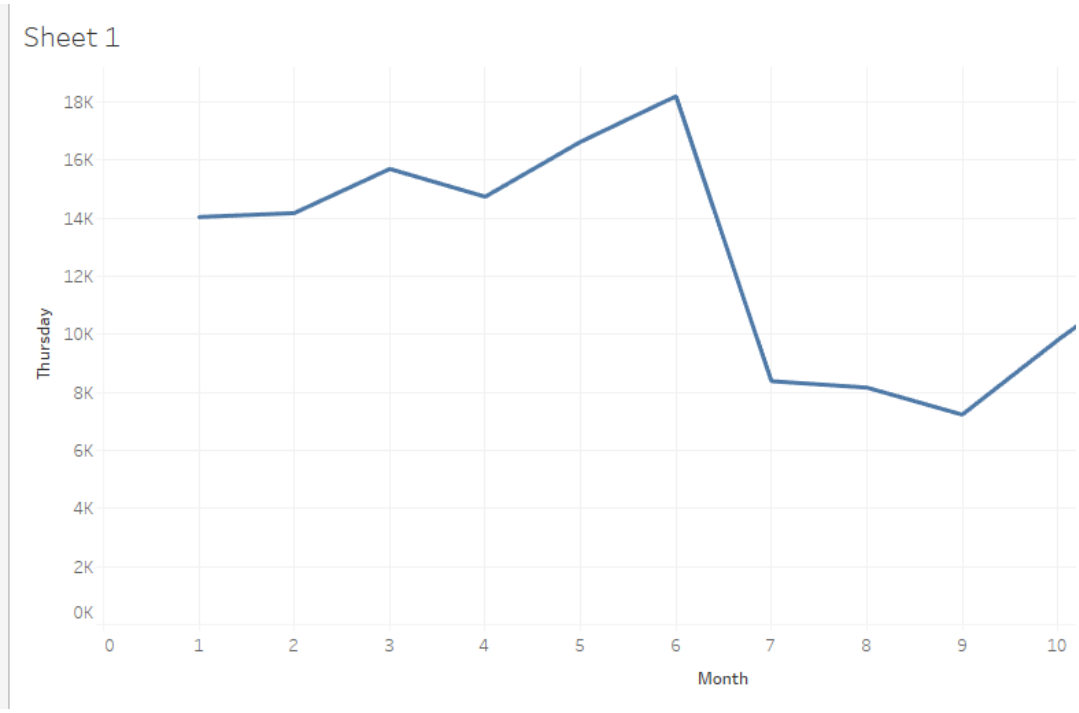
As displayed in the graph below the transaction on Thursday of all the 12 in January and February number of customers were below 250k, in March it was above 250k, less than 250 April, greater than 250k in May, also greater than 300k in June, less than 150k from July - September and greater or equal to 200k from October – December. Among the months maximum in June then decreased in September, July, and August. It is more or less similar to Monday. The difference is that in September decrease. business transaction in these months is low. Sometimes budget release from the government would be late, the business activity would be minimum in this month.

Graph 4.8. the number of customers on Thursday of 12 months.



Source own tableau 2021ed

Graph 4.9. the usage patterns of customers on Thursday.

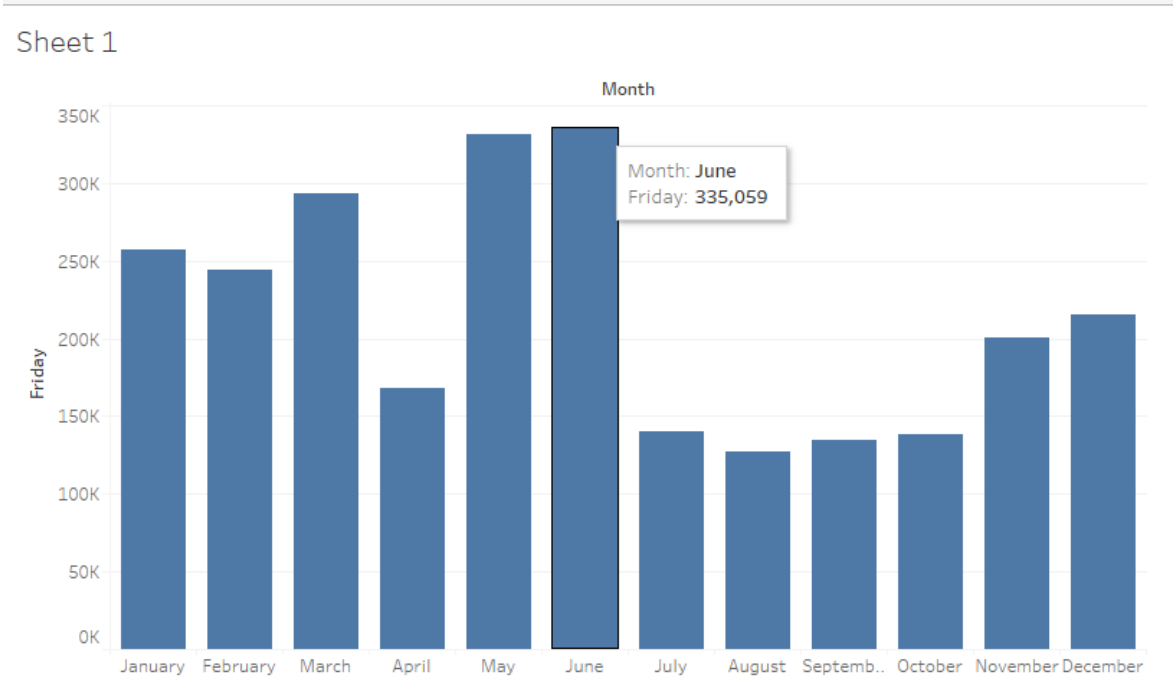


Source own tableau 2021ed

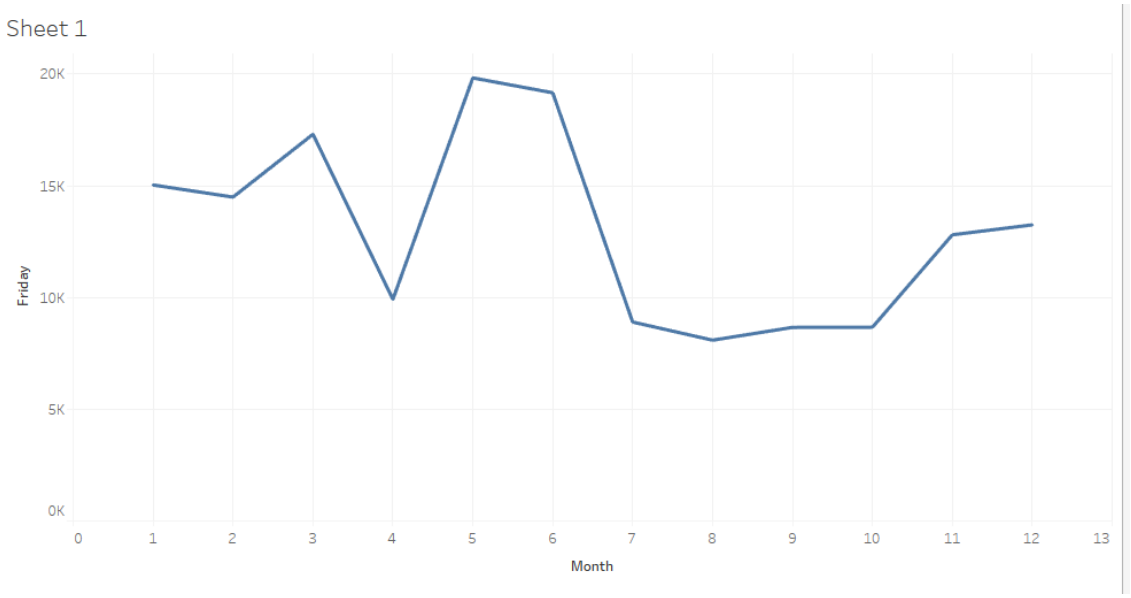
Analysis of Friday

As can be seen from the following graph on Friday the number of customers was greater than 250k in January, less than 250k in February, greater than 250k in March, less than 200k in April, greater than 300k in May and June, less than 150k from July -October and finally greater or equal to 200k from November- December. The usage patterns customers reported as from January to February decreased, then increase in March, a cliff decrease in April, then also a cliff increase in May and June, then decrease in July, August, and September, finally an increase in October, November, and December. The difference is visible that the number of customers varies from 100k – 335k which is a huge gap in months. The insight from this is that business transaction varies according to the result.

Graph 4.10. the number of customers on Friday in 12 months.



Graph 4.11. the usage patterns of customers on Friday in 12 months.



Source own tableau 2021ed

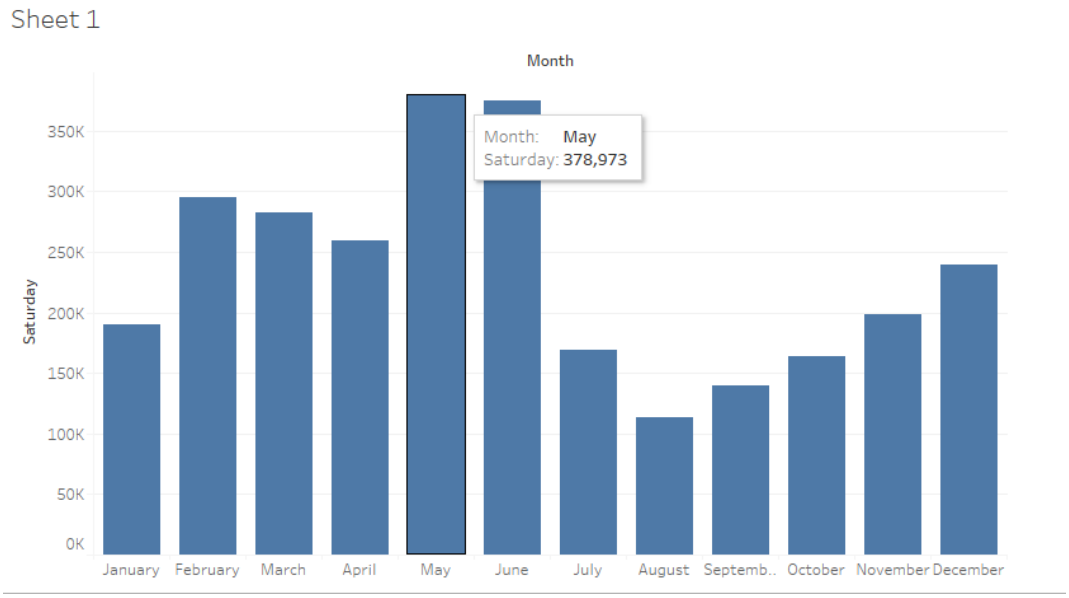
Analysis of Saturday

The following result revealed that customers transaction on Saturday maximum in May and June, minimum in august and July. The detailed analysis result depicts that in January it was greater than 150k, from February -April it was greater than 250k, in May and June the number inclined to more than 350k, from July – September was below 200k and finally, in October and December, the number increased again over 150k.

The patterns of customers on Saturday

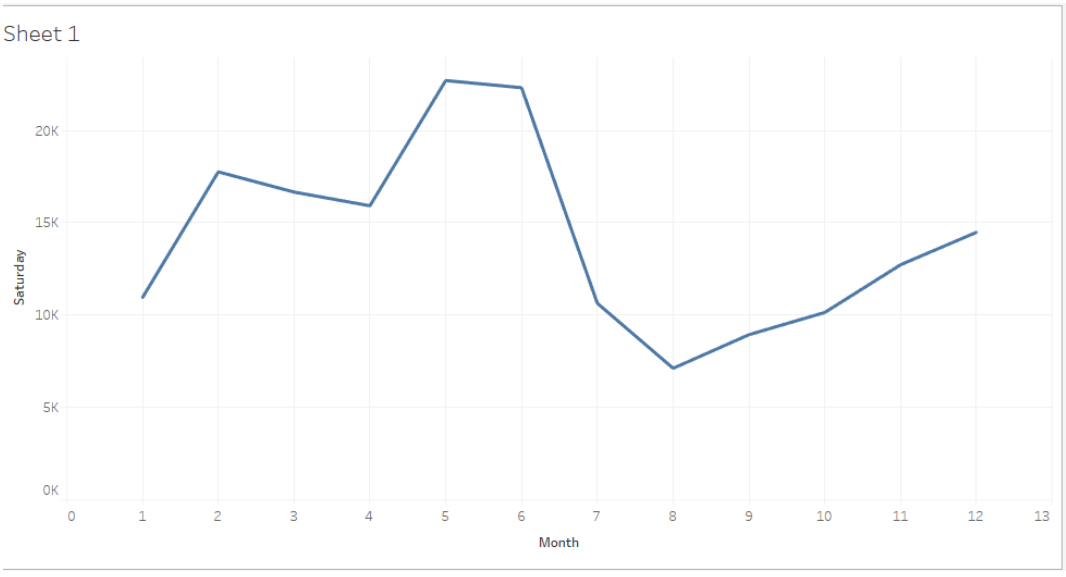
From January through February, there is an increase, followed by a reduction until April, a sudden increase in May and June, followed by a decrease in July and August, then a continuous increase for the last four months. The insight would reveal that the value of a business transaction fluctuates depending on the month of the year. The bank would be more effective if it ran an ad campaign during these possible months to increase the number of people who use mobile banking.

Graph 4.12. the number of customers on Saturday in 12 months.



Source own tableau 2021ed

Graph 4.13. the usage patterns of customers on Saturday in 12 months.



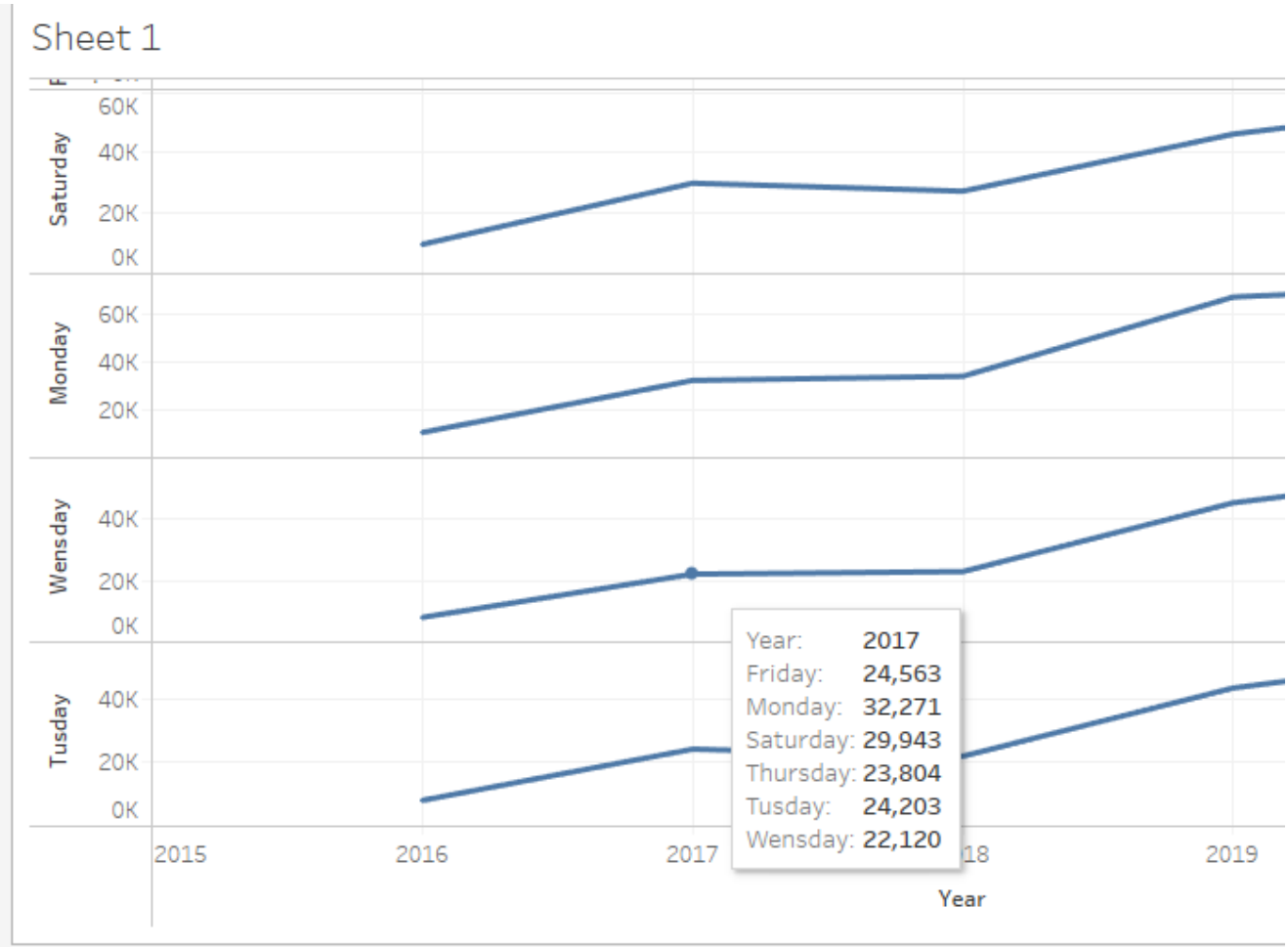
Source own tableau 2021ed

4.8 The trends of the dates in the consecutive years

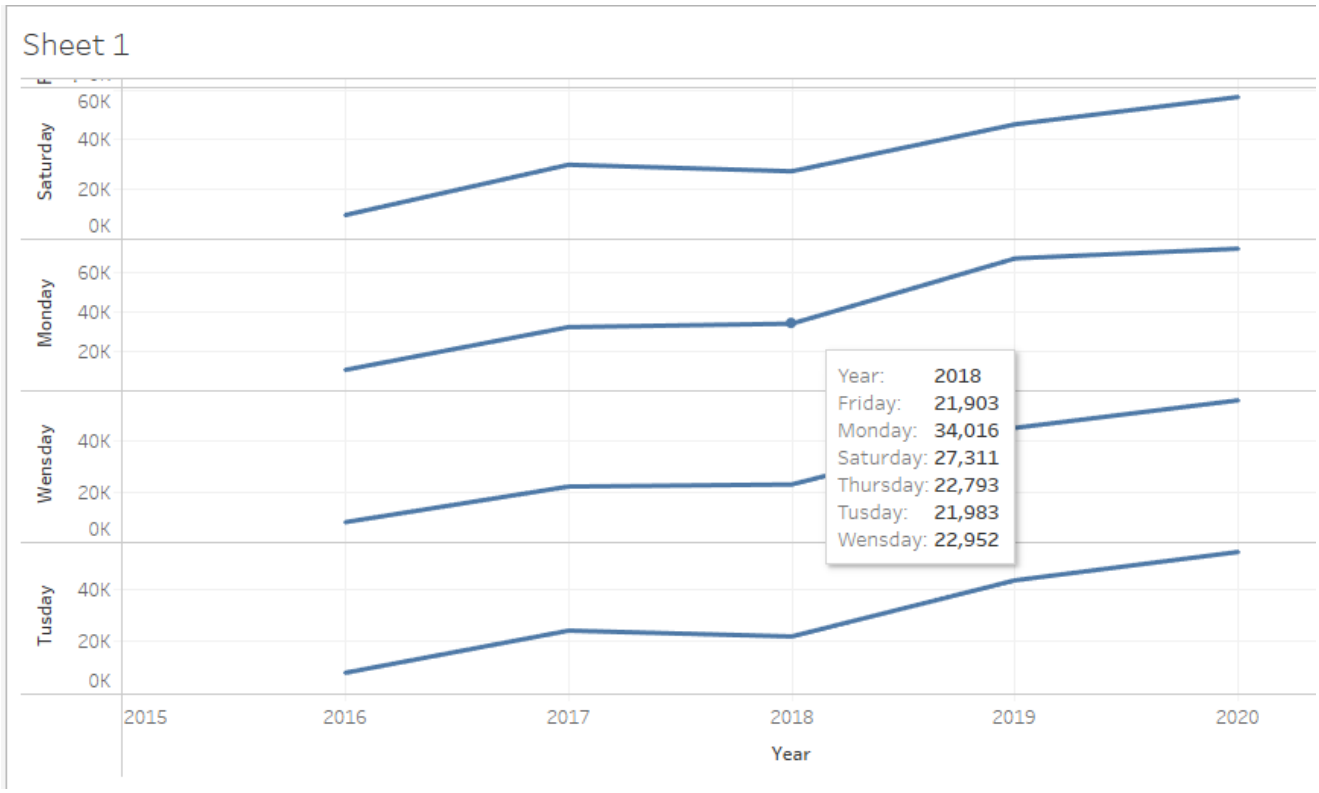
As can be seen from the figure below Only Monday and Wednesday have seen an increase in client numbers over the years, but the other four days have seen an increase in 2016, 2018, 2019, and 2020, and a loss in 2017-2018. In 2017, the number of consumers on Monday 32271, Tuesday 24203, Wednesday 22120, Thursday 23804, Friday 24563, and Saturday 29943 was shown. According to successive dates of the week in 2018, the number of clients increased to 34016,21983,22952,22793,21903,27311. This is an intriguing finding: the two days have seen an increase in the number of consumers, indicating that the tendency of customers transacting on these dates continued to rise in the 2017-2018 period.

The consequence is that the trend of dates on Monday and Wednesday has been increasing from year to year in recent years, but the trend of dates on Tuesday, Thursday, Friday, and Saturday has only been increasing in 3 years and dropping in one year, according to the study report.

Graph 4.14 The trends of dates from 2016-2020.



Graph 4.15 The trends of dates from 2016-2020.



4.9. Analysis of the months

Which months do many mobile banking customers do transactions?

To answer the above question distribution and patterns of each day's 12 months were analyzed as follows. The detailed analysis of the existing data revealed the following result the distribution patterns of each day in all months. The day minimum at august and July, maximum at May and June.

Customers' consumption patterns begin in January, increase in February, a decline in April, then increase until June, a cliff decreases in July and August, and finally, a constant increase from September to December. The inference and takeaway from this are that business interaction is strong from January to February, but drops in March and April. Fasting was observed by orthodox and catholic Christians, as well as Muslims, in Ethiopia throughout these two months. Fasting patterns in the country have harmed business, with the result that mobile banking transactions have decreased during this time. The patterns of transaction in May and June an exponential an increase the implication from this is business activities in

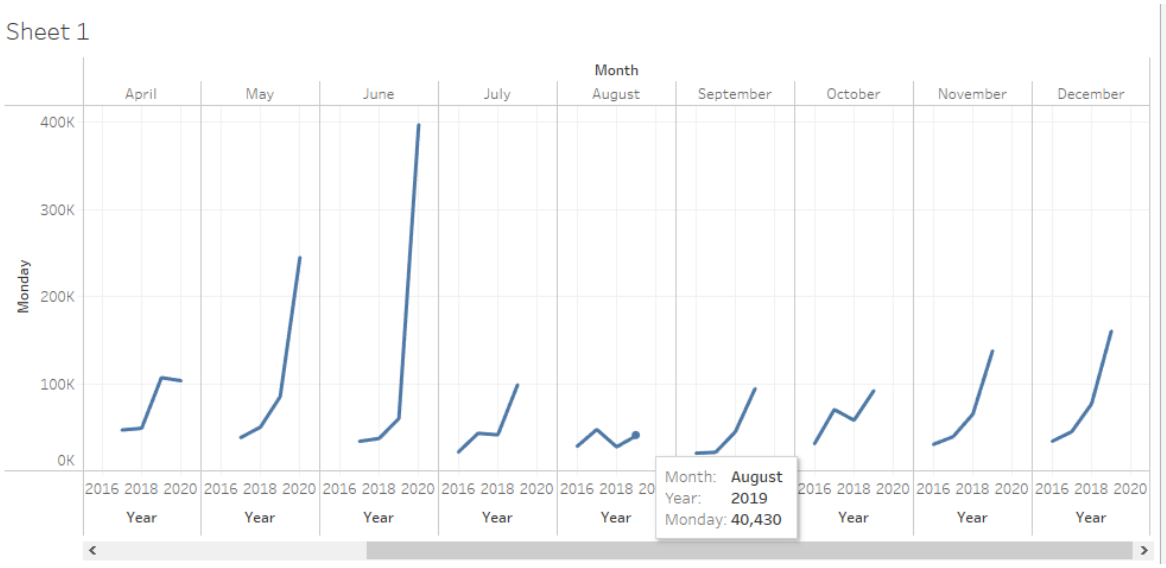
these months is high. Most governmental and private organizations usually made final purchases and payments during these months because the fiscal year ends on June 30. The patterns transaction in July and august is dramatically decreased, thus at these times no budget release, In the rainy season, the business interaction is slow to dawn. The trend of mobile banking transactions in September, October, November, and December is diagonal increase. These months are dry seasons; thus, the government budget is released, agricultural products are injected into the market so that business activities of the country would accelerate during these months.

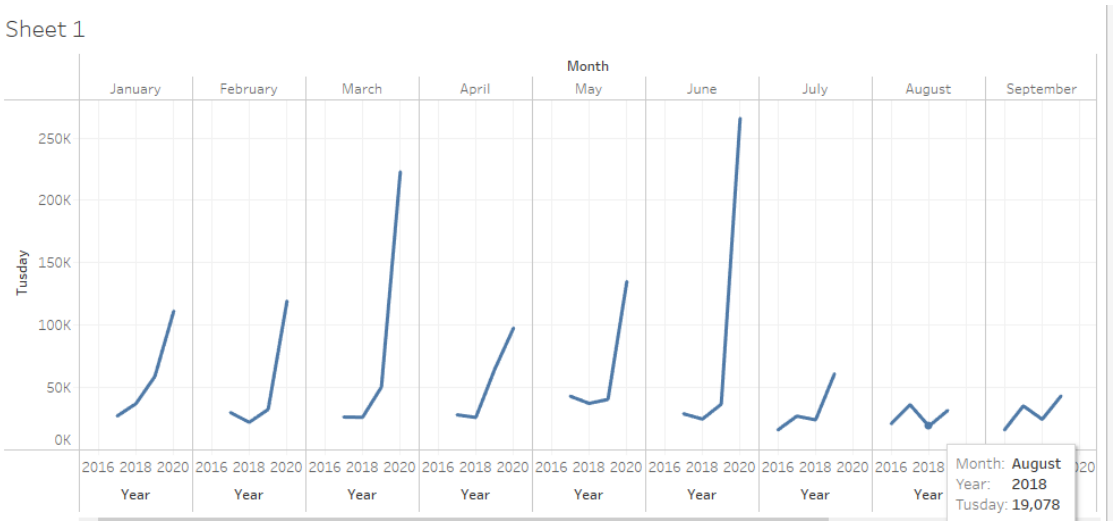
4.10. The relationship between dates, months, years, and customer transactions

As can be seen from the graph visualized below the 6 days, then 12 months, and 4 years on Monday, many customers transfer their money using mobile banking in June. During the same day, lesser customers transfer their money in August. In the same analogy on Monday, many customers transfer their money in the year 2020. On the other hand, on Monday in august 2018 customer transactions is the lowest. The implication from this is that business transactions in August and the year of 2017-2018 were declined. The year 2018 was the time of political crises in the country. Thus, the ruling party made a political reform. in 2020 the year after political reform had been taken. The above insight information tells us that customers are most active in using mobile banking services on Monday of June in the year 2020. We can infer from this is that, customers business transaction is higher on Monday In the same analogy, in June customers business interaction is maximum of all the 12 months. The other inference that can be drawn is that customers attitude is increasing from 2018-2020. As can be seen from the following graph august has the minimum customer transactions, from this information we conclude that business interaction in this month is the lowest of all. In the same analogy, in 2017-2018 business transactions were highly declined. We can draw the inference that at the time rainy season business activities would be declined and an important insight is that during political instability most businesses were highly declined.

The relationship between dates, months, years, and number of customers. As can be seen, the figure below the number of customers who do the transaction on Monday of the 4 years has a huge gap between months. for example, in August their number was below 100,000 but in June the number increased up to four-fold of that of August 400000. In the same analogy, the number of customers in the year 2020 is 4-fold than in the year 2017-2018.

Graph.4.13.the relation between Monday month and years

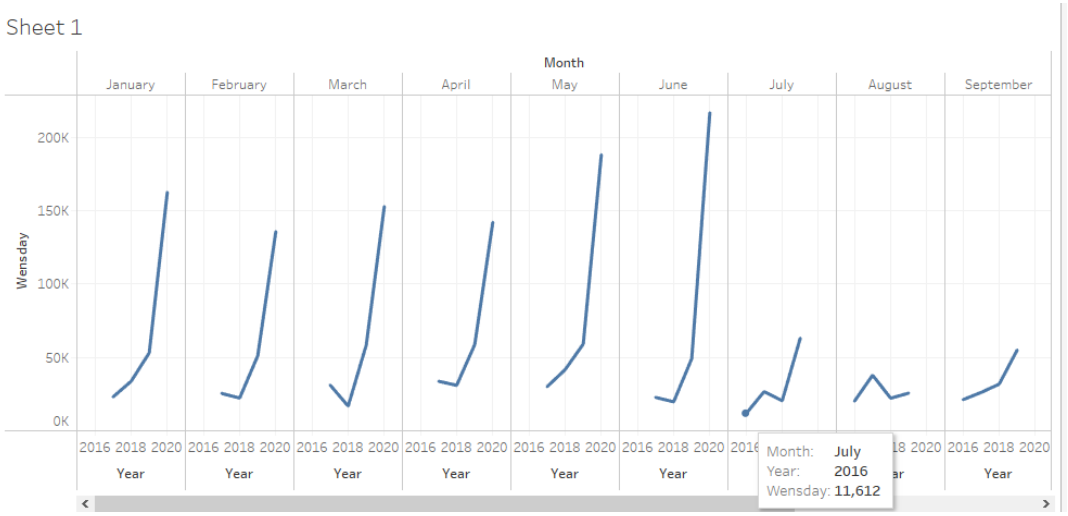




Source own tableau 2021ed

Graph 4.14.the relation between Tuesday, months years, and transactions.

The relation between Tuesday, month, years and the number of customers As can be seen above the figure the number of customers on this is below 50000 in August and from 2017-2018 but it is above 250000 in June and the year 2020



Source own tableau 2021ed

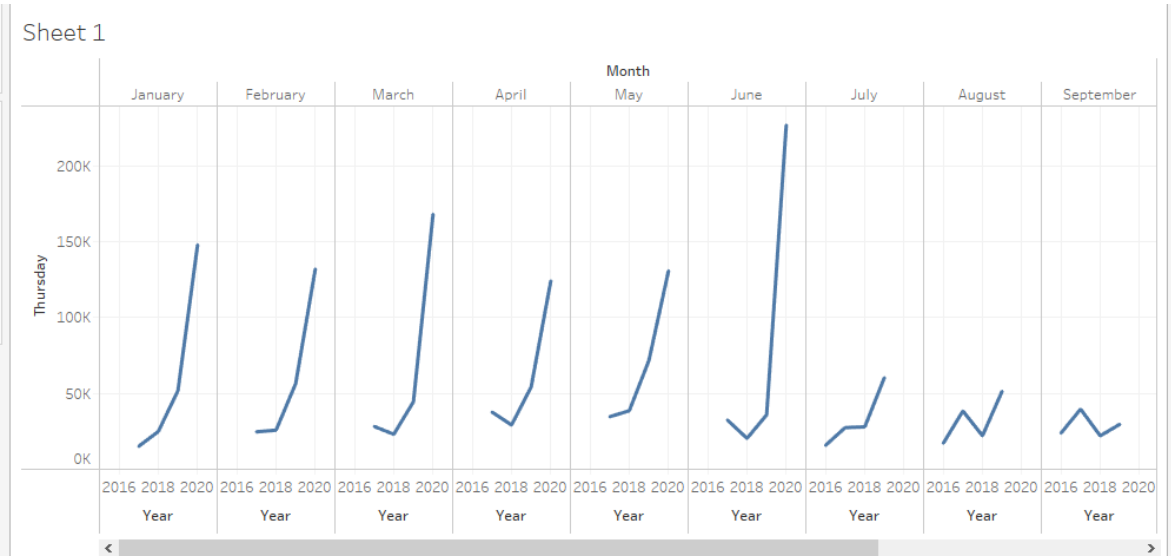
Graph 4.15.the relation between Wednesday, months, years and number of customers

The relation between Wednesday, months, year and the number of customers The above figure has shown that the number of customers in June and 2020 is above 200000but in July and August and 2016 is below 50000, which is less than 4 fold of June and 2020.

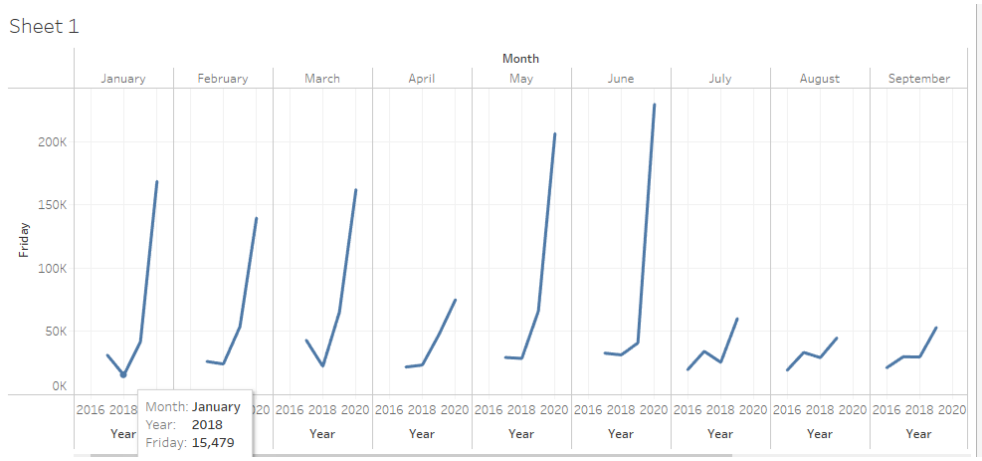
The relation between Thursday, months, years and the number of customers.

As can be seen below the figure the number of customers in June and 2020 is above 200000 but in August and from 2017-2018 is below 50k which is about 5 times lower than June and 2020.

Graph 4.16 the relation between Thursday, months, years, and number of transaction



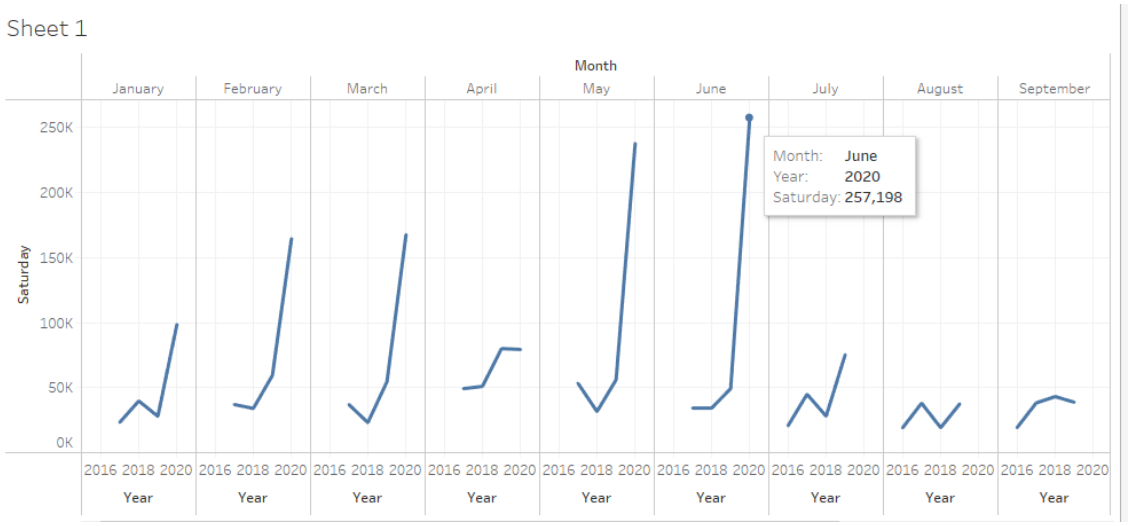
Source own tableau 2021ed



Source own tableau 2021ed

Graph 4.17. the relation between Friday, months, years, and number of customers

The relation between Friday, months, years and the number of customers. The above figure shows that the number of customers in June and May is above 200k but in August it is below 50k. The relation between Saturday, months, years and number of customers As can be seen in the figure below the number of customers in June and May is above 200k but in August it is below 50k. In the year 2020, the number exceeds 200k



Source own tableau 2021ed

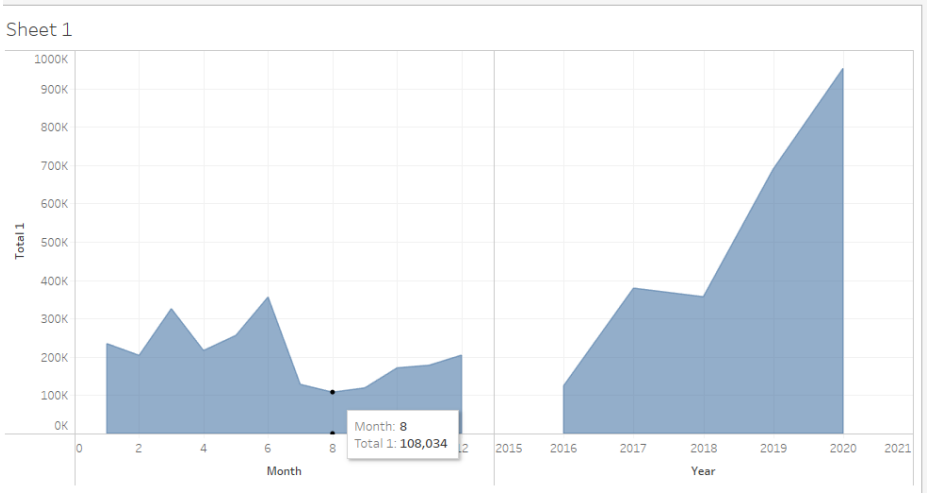
Graph 4.18. the relation between Saturday, months, years and number of customers

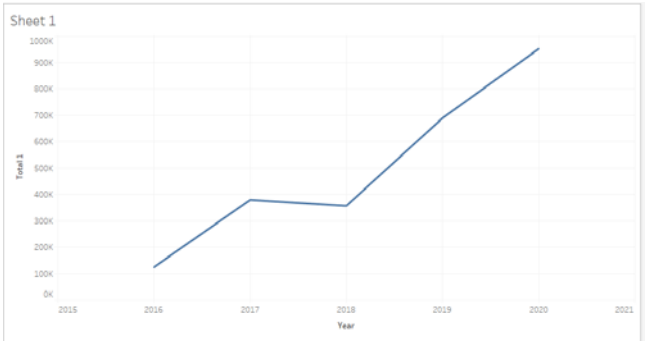
The interpretation of the above graphs the relation between dates, months, years, and the number of customers who made transactions has similar trends. The implication from this is that customers transactions in 4 years have got a huge gap between months and slight in one year. The gap could be associated with business transactions of customers. In the same analogy in March, February a medium number of customers registered. The result confirmed that the attitude of the customers is increasing from year to year these are important findings of the study.

4.11. The relationship between total customers in each year and 12 months

The following result shows the usage patterns of customers in consecutive 4 years. As can be seen, the total count 1 figure below the maximum number of customers showed below 400k in June and above 100k in August in the same way before 2018 the number of customers was below 4000k or 400000 but after 2018 up to 2020, the number escalated to more than 900k or 900000. The takeaway from this is that the practice and attitude of mobile banking customers are increasing. From 2017-2018 an increment of the number of customers was slow down this could be because business activities were meltdown.

Graph 4.19. The customer transaction of total count 1.



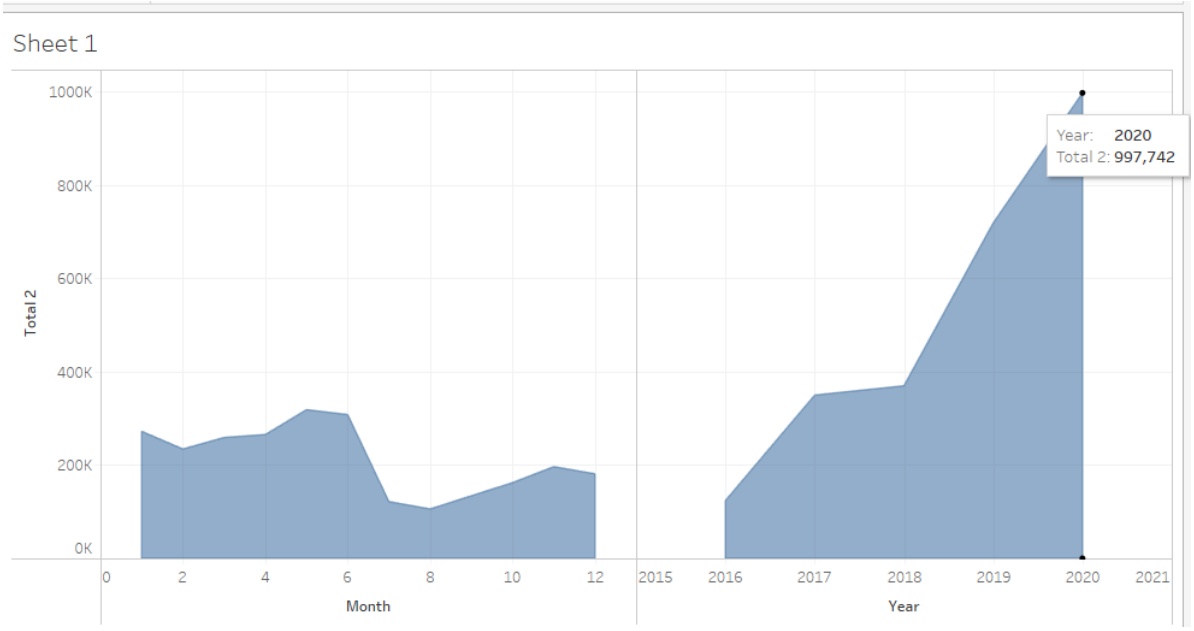


Source own tableau 2021ed

Graph 4.20.the trends of customers in total count 1.

Analysis result of total count 1

From the above graph customers transaction from 2016-2017 G.C. is increasing patterns, then from 2017-2018 is decreasing pattern, from 2018-2020 it shows an increasing pattern. The interpretation from this is that the business transaction slows down in the year 2017-2018, but in the other years there was an increase. The implication from this is that mobile banking customers usage pattern is increasing except decreased only one year from 2017-2018. The time 2017-2018 was a situation of political crisis. The ruling party made political reform, from 2018 till now the country is under political reforms. After government reform a continuous increase in mobile banking transactions in this bank.

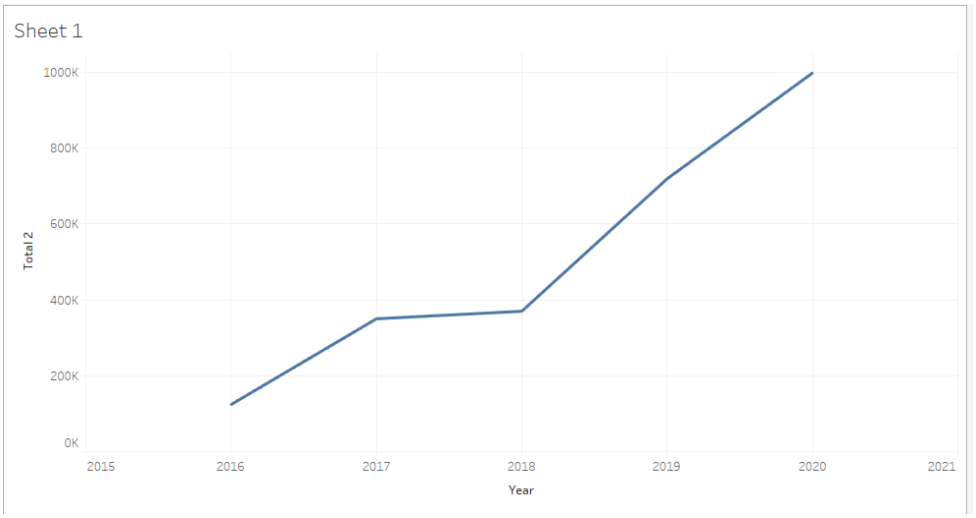


Source own tableau 2021ed

Graph 4.21. customer transaction of total count 2

As can be seen in the graph the number of customers in January was over 200k, it declined in February and then increased 335k from March to June, decreased to 50k in July and August and finally increased to 100k.In years the number showed a continuous increase except 2017-2018.

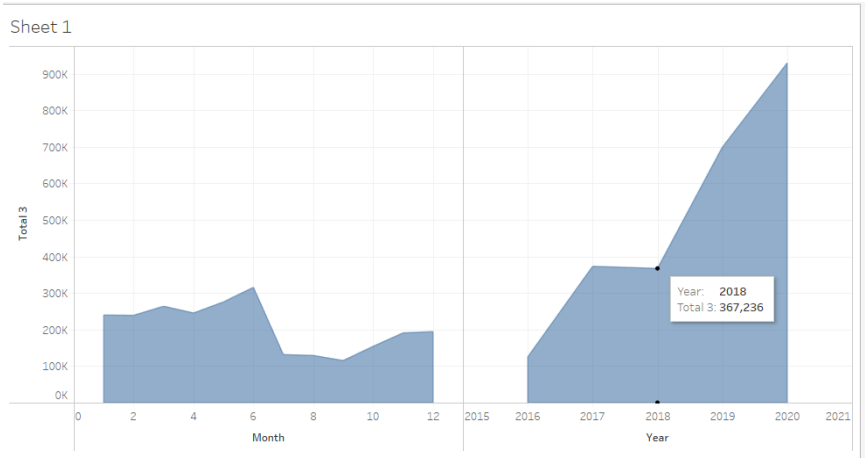
Graph4.22 trends of customers in total count 2



Source own tableau2021ed

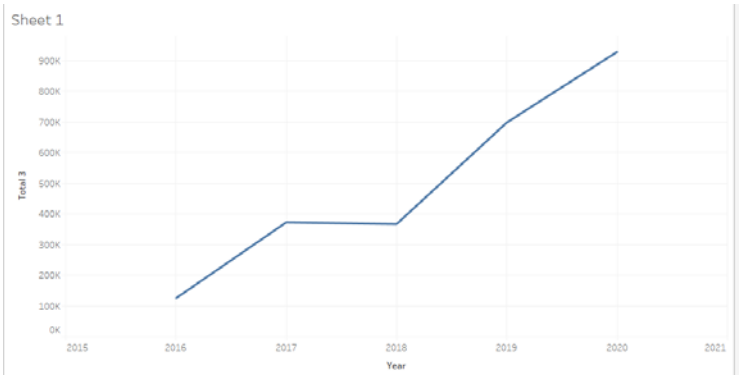
Analysis of total count 2

The pattern is similar to the above result. The detailed analysis result also revealed that the number of customers is increasing from year to year this is an indication that the practice and attitude of customers are increasing at an alarming rate.



Source own tableau 2021ed

Graph 4.23.customer transaction of total count 3.



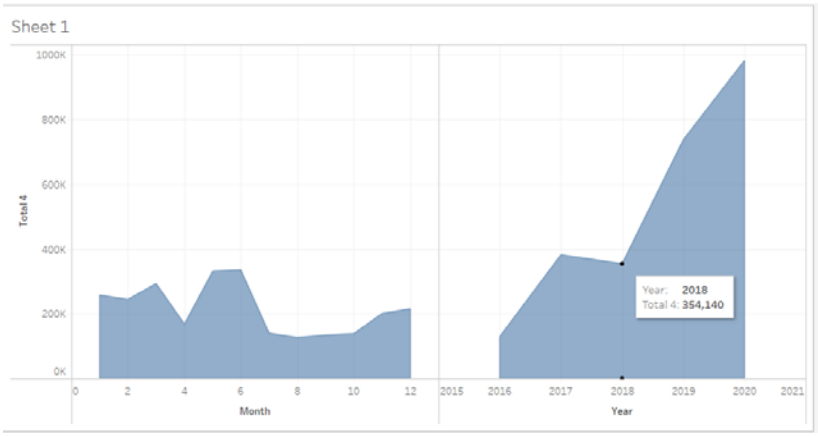
Source own tableau 2021ed

Graph 4.24. trends of customers total count 3

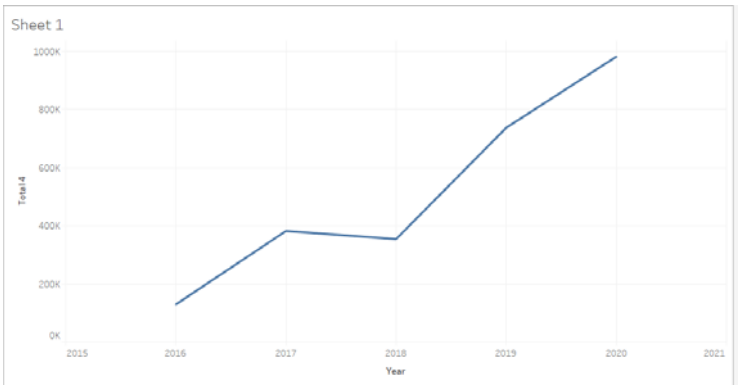
Analysis of total count 3

From the above graph the pattern is similar to the above two results, but a slight bending in the mid of 2019 G.C. At that time the death of the popular Amhara region administrators and Generals of military higher officials. Thus, political instability occurred in the country.

Graph 4.25 customers transaction of total count 4.



Source own tableau 2021ed

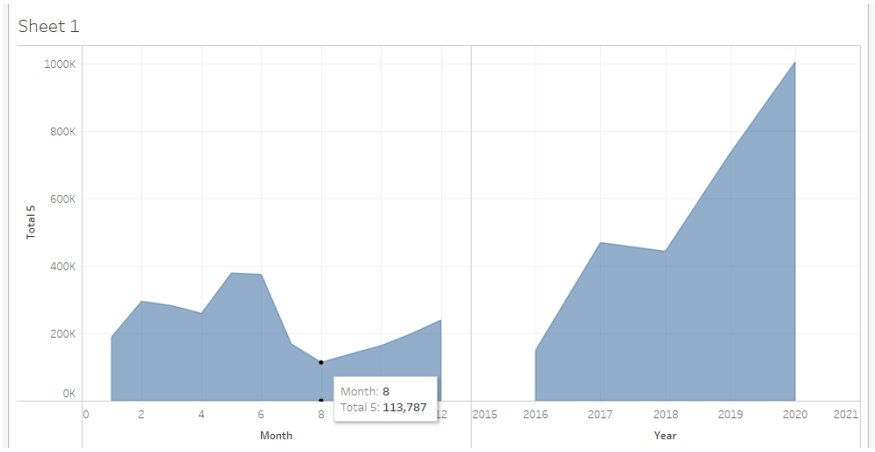


Source own tableau 2021ed

Analysis of total count 4

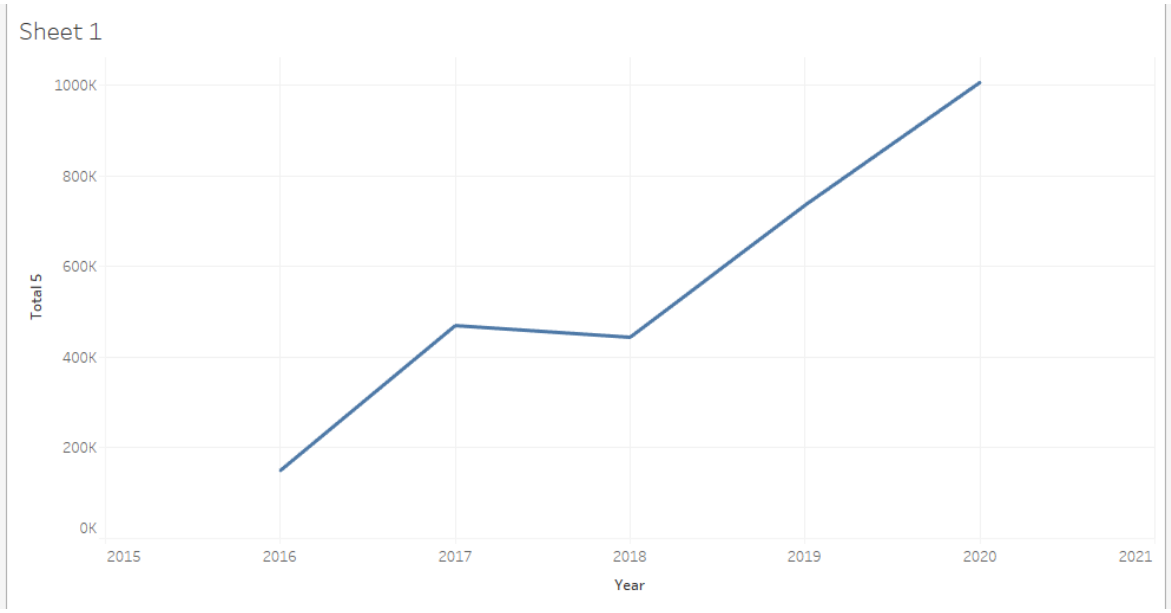
The above graph shows similar results as the total count four.

Graph 4.26. the total count of 5 customers



Source own tableau 2021ed

Graph 4.27. The usage patterns customers



Source own tableau 2021ed

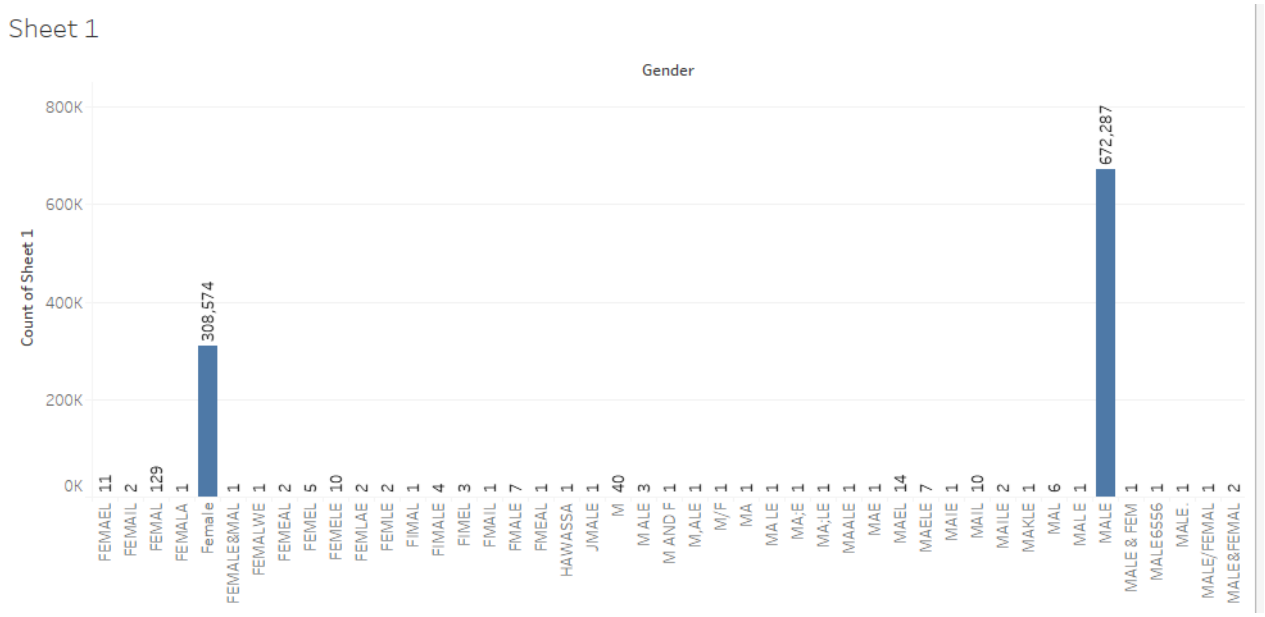
Analysis of total count 5

The patterns in this graph are also the same as total count 1. The takeaway from this is that customer transactions were increasing from 2016-2017 and 2018-2020, but it was slightly decreasing from 2017-2018 for the reason there was political instability in the country.

4.10. Analysis of Gender

The researcher also explored how gender is related to customers transaction. as can be seen from the graph below, 672287 or 67.23% of customers are male customers while 308574 or around 30.86% are females and 18560 or 1.86% are not recorded or null. The implication from this is that males have a better understanding and practice than females. Thus, it was an alert for the bank to do target full promotion and continued to follow up.

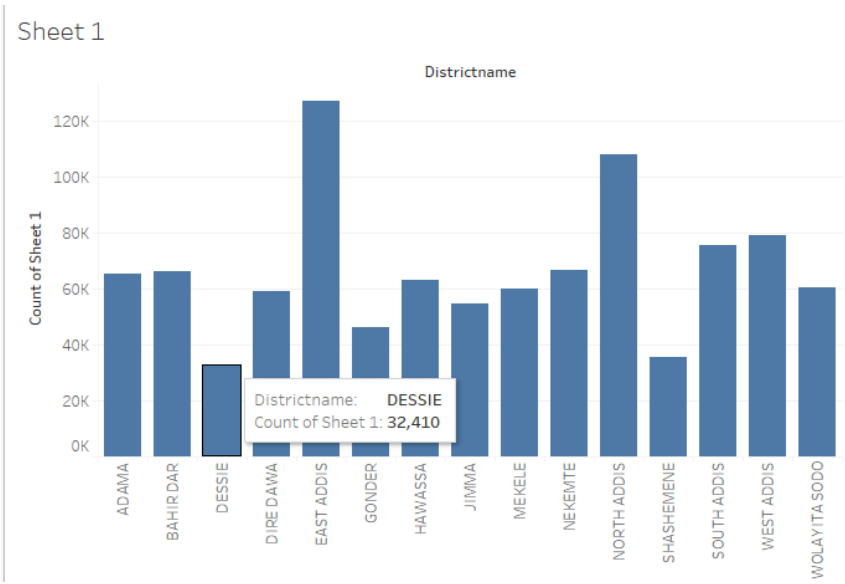
Graph 4.28. gender of the customers



Source own tableau 2021ed

4.11. Analysis of Districts

Graph 4.29. mobile banking customers districts



Source own tableau 2021 ed

Analysis of the district

As shown district graph above east Addis Ababa and north Addis Ababa districts have maximum customers transaction, whereas Nekemte 66855, BahrDar 66286, Adama, Hawassa 63175, Wolayta 60479, Mekele 59978, DireDawa 59210, Jima 54548, Gonder 46423, Shashemene 35463and Dessie 32410 number of customers these districts have a record of minimum customers in the other districts in the bank. The lesson taken from this is that attitude change about mobile banking services varies accordingly the result of districts. In addition to this, the business transaction in Addis Ababa is the highest of all districts in the bank, and business transaction in Shashemene and Dessie districts is the lowest. This information has very interesting insight. It is possible to infer from this is that customers who are in Addis Ababa have a better understanding and a positive attitude about mobile banking services than other districts of the bank. Thus, it is an indicator for targeted ads campaign and follows up by the commercial bank of Ethiopia.

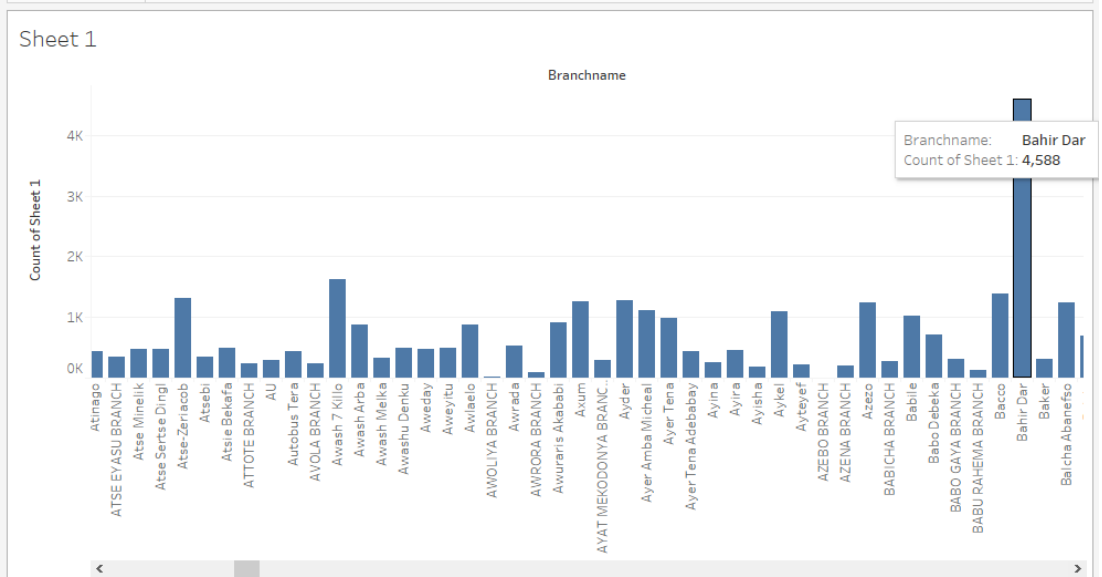
The additional insight survey of districts in the commercial bank of Ethiopia.

Additional insight information from the above figure is that among the districts of mobile banking customers the report showed as Dessie has 11th, Shashemene has 10nth, Gonder has 9th, Jima has 8th, Dire Dawa has 7th, Mekele has 6th, Wolayta has 5th, Hawassa has4rth, Adama has 3rd, Bahr Dar has 2nd and Nekemte district has 1rst rank in the number of mobile banking customers. This is an interesting result that we can infer that the attitude of customers towards mobile banking in these districts varies accordingly with the above result. Thus, the bank should have to plan ads campaigns and other tactics to subscribe to additional customers.

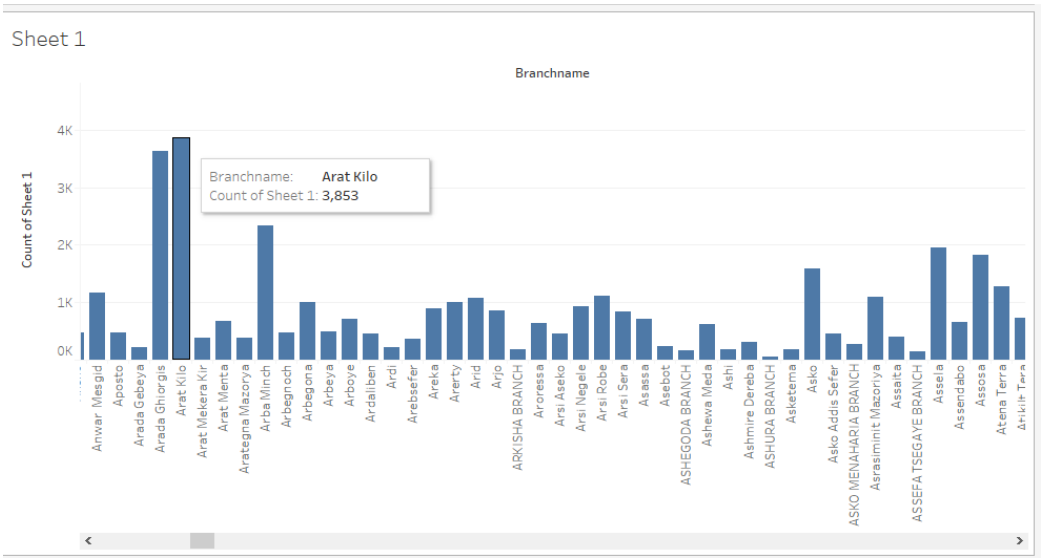
4.12. Analysis of the branches

As can be seen below the graph Bahrdar, Arat kilo, Arada Ghiorgis branches have the 1rst,2nd and 3rd rank of the number of customers consecutively. Bahardar has 4588, Arat kilo branch has 3853, Arada Ghiorgis branch has 3631 mobile banking customers. There are many branches like Azebo, Awoliya, Ashura, and other branches that have less than 1000 customers. The takeaway from this is that customers of these branches have better attitudes than the rest of all branches.

Graph 4.30.A.mobile banking customers branches



Graph 4.30.B. mobile banking customers branches

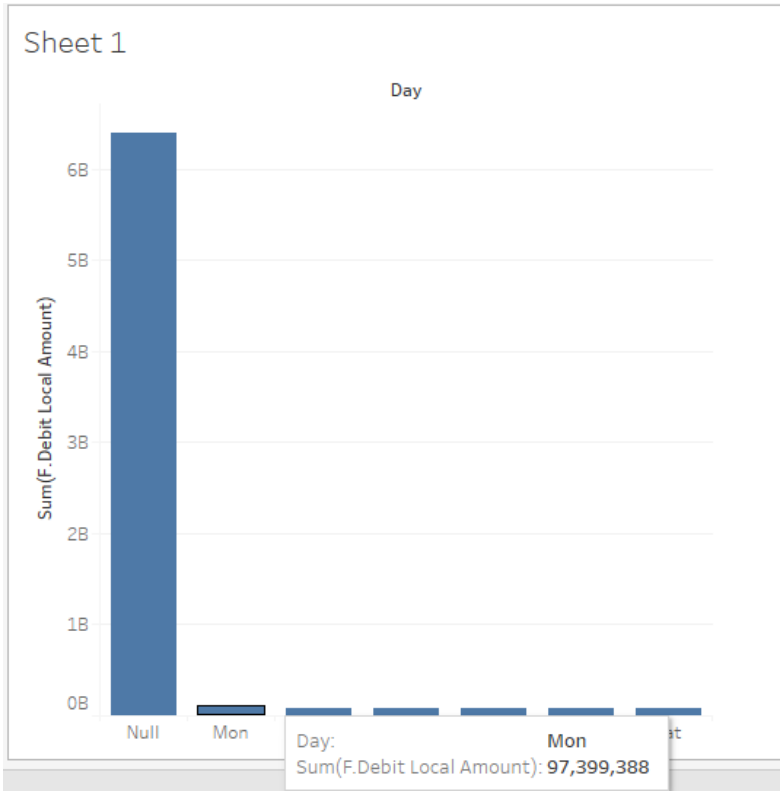


4.13.Analysis of the amount of money transfer in date, month, and years

Table 7: The transformed customer's transaction data

2,000	Mon	4	2019
1,000	Mon	4	2019
2,000	Mon	4	2019
500	Mon	4	2019
200	Mon	4	2019
61,500	Mon	4	2019
100	Mon	4	2019
1,300	Mon	4	2019
2,000	Mon	4	2019
300	Mon	4	2019
2,000	Mon	4	2019
6,000	Tue	4	2019
199,600	Tue	4	2019
2,750	Tue	4	2019
600	Mon	4	2019
6,000	Mon	4	2019
5,000	Mon	4	2019
600	Mon	4	2019
2,000	Mon	4	2019
1	Mon	4	2019
7,000	Mon	4	2019

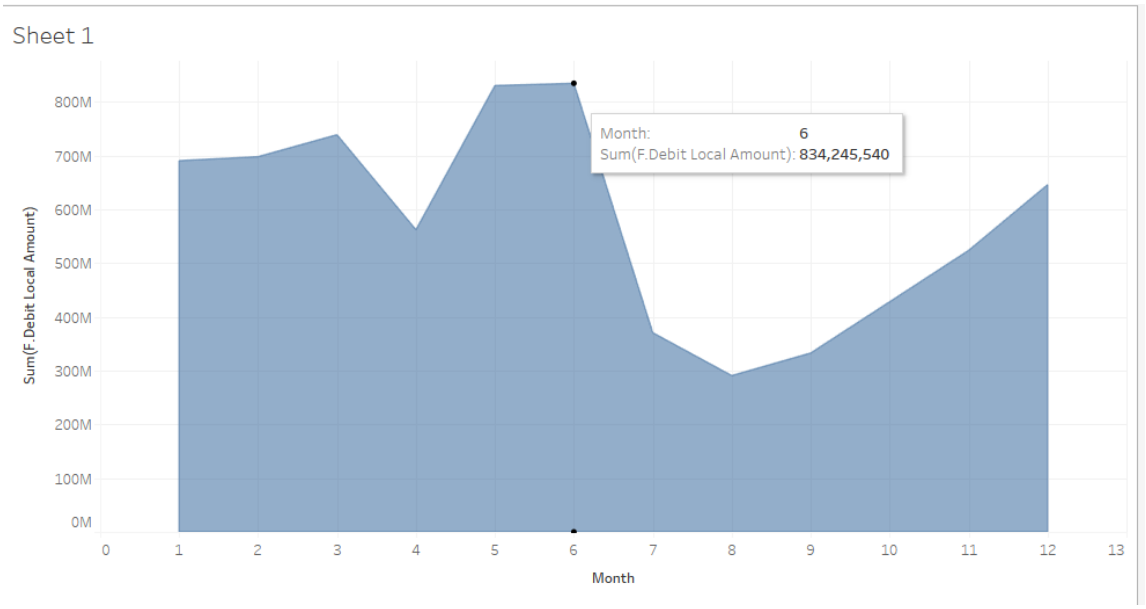
As can be seen in the above-transformed data the minimum amount of money that customers transfer one at a time is one birr. Thus, the maximum amount is about 200,000 birr but not limited. The implication from this is that mobile banking customers transfer money for different purposes like top-up air time, purchasing goods and services. In the same analogy from the following graph, on Monday is 97,399,388 birrs transferred which is the highest of all the dates of the week and on Friday 77542807 birr transferred through mobile banking the least of all the dates. We can rank from the highest to lowest, Monday, Wednesday, Saturday, Tuesday, Thursday, and Friday.



Graph 4.31. The amount of money transferred in the dates of the week.

As can be seen below the amount of money transferred through mobile banking in 12 months varies from month to month. From January up to March the amount of money was transferred about the range of 700-750 million birrs, from April to May it was about 550-800 million birrs, in June it is the highest of the 12 months that is about 834,245,540 birrs, from July-August declined to about 290,707,323birr which is the lowest amount of money and from September -December 30 was inclined from 290,707,323 birrs up to 600 million birrs. The take away from this is that business transaction in these months is high and declined in August. Additional insight is that customer attitude has shown fluctuated from month to month or customers usage pattern varies from month to month.

Graph 4.32.The amount of money transferred through mobile banking in 12 months.



CHAPTER FIVE

5. SUMMARY OF FINDINGS, CONCLUSIONS, RECOMMENDATIONS, LIMITATIONS, AND FURTHER RESEARCH SUGGESTIONS

5.1. Introduction

This chapter provides a summary of the major findings followed by conclusions, recommendations, and future research agenda are drawn and discussed. The recommendations and future research agendas are based on the summary of the results conclusions.

5.2. Summary of the major findings

Based on the findings of the study, the following important points are summarized from the results of the study.

- The detailed analysis result showed that mobile banking customers of commercial bank of Ethiopia utilized the service on Monday and Saturday is the highest, on Thursday and Tuesday the number of customers is relatively minimal.
- The result also revealed that the number of customers in June is the maximum and in August is the lowest on the same date.
- Customers' usage patterns are more or less identical on these days, with ups one day and down the next, forming a zigzag pattern.
- The usage pattern of customers showed fluctuation across the months.
- The usage pattern of customers has shown increasing across the years but the speed of increase is different that is in some years fast increase the other years has a slow speed of increase.
- The trend of the dates in the consecutive years the result showed that the number of customers is continuously increasing only on Monday and Wednesday the other days showed decreasing 2017-2018 this is an interesting insight.
- The result of total count in 4 consecutive years showed that the number of customers has a similar trend in total count 1,2,3,4,5 that is a continuous increase in the consecutive years except from 2017-2018 slight increase.

- The detailed result of the analysis showed that mobile banking customers constitute 67.23% are males and 31% are female the rest 1.8% are unidentified.
- The result also showed that the east Addis Ababa district has the highest number of mobile banking customers and the Dessie district has the least number of customers.
- In the bank, without Addis Ababa among the districts, the result revealed that Nekemte district has the highest followed by Bahrdar and Adama. Dessie districts have the least number of customers.
- Amount of money transferred through mobile banking once at a time result showed from 1birr up to 200000 birrs but not limited.
- In one day, the result showed that about 97,399,388 birrs transferred through mobile banking which is the maximum amount of money.
- In June, about 834,254,540 birrs transferred that is the highest of all the months.

5.3. Conclusions of the major findings

The main objective of this research was to make data analytics of mobile banking customer usage behavior in the commercial bank of Ethiopia. According to the analysis and discussions of the study, the following conclusions are drawn on data analytics of mobile banking.

The first specific objective of the study was to analyze each date, month, and year that mobile banking customers transfer money through mobile banking services. The study found that customers made transactions on Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday but the system did not have a Sunday record. Among the 6 dates, the study found Monday and Saturday have the highest number of customers and on Thursday and Tuesday the number of customers is lower than the rest dates. The study also found that customers made transactions in all 12 months from these months June and May have the highest number of customers and August has the least number of customers. In the same analogy, the study found that mobile banking customers utilized the system from 2016-2020. Among the years the number of the customer was continuously increasing but from 2017-2018 the result showed a slow increase. The implication from this result is customers made more business transactions on the 1st and last day of the week and customers practiced mobile banking more on these dates. The takeaway from the monthly result is customers of the commercial bank of Ethiopia made huge transactions in June and May the reason be many governmental and private organizations made payments and final purchases before the end of the fiscal years. In August customer transactions got the lowest the business transaction was lowest in the same

analogy number of customers was increasing continuously because the usage behavior of the customer was increasing and many customers practiced mobile banking services. The study also found that the number of customer transactions from 2017-2018 slowly increased it was the time of political instability in the country. The business transaction in that time decreased because of the instability of the country.

The second specific objective of the study was to derive insightful information from customer data the result depicted that the customer transaction process is directly linked with the business activities of the customer and the usage pattern of customers towards mobile banking is increasing across the years but there is fluctuation across dates and months. Additional insight drawn is that the performance of each district and branch the result showed a huge gap moreover, the number of customers in districts of different regions showed a large gap. The usage behavior and practice of customers towards mobile banking varied from district to district in the county. The residents of the capital city of the country have a better understanding of mobile banking services than other regional districts. The study also depicted that there is a huge gap between different districts of the country. Some unexpected district has got the highest number of customers.

The third specific objective of the study was to investigate the usage pattern of mobile banking customers in the commercial bank of Ethiopia. The findings revealed that customers' transaction activities fluctuated from day to day and that they were not all the same. The thorough study result also revealed that, unlike the months, the consumers' usage pattern was consistently increasing over the four years.

The fourth specific objective of the research was to analyze the trend of the dates in consecutive years the research found that Monday and Wednesday customers showed a continuous increase and the other days customers showed a decrease in one year but increase in 3 years these dates do not have uniformity.

The fifth specific objective of the research was to profile customers based on their gender the research found that 67.23% of the total customers were males and 31% were females the indication from this is that attitude of males is higher than females. There is a two-fold gap between male and female customers of the commercial bank of Ethiopia.

The sixth specific objective of the study was to make the comparison between the bank districts the study found that from Addis Ababa east Addis has the highest number of customers whereas south Addis has the least number of customers. At the county level among the districts, East Addis is the highest, and Dessie districts have got the least number of customers. The implication taken from this is that the usage behavior of mobile banking customers in Addis Ababa, Nekemte, Bahrdar, and Adama is better than the rest of the districts of the bank.

The last specific objective of the study was to know the range of amount that mobile banking customers transfer money through mobile banking the result showed that it is from 1 birr up 200,000 birrs once at a time but not limited. It is also confirmed that in one day about 97 million birrs were transferred and in one year more than 834 million birrs were transferred through mobile banking.

5.4. Recommendations

Based on the findings and conclusions the following recommendations are forwarded.

The number of mobile banking clients was found to be lower on Thursday and Tuesday than on other days in this study, thus the researcher suggests that the bank run extensive ad campaigns and raise awareness to increase the number of consumers on these days. The number of clients was also discovered to be at an all-time low in August, prompting the researcher to propose that the bank make every effort to boost the number of customers. As a result, using this finding as a guide, the bank should focus on actions aimed at influencing people's attitudes toward mobile banking services.

Finally, this study discovered that, except from 2017-2018, the number of clients increased steadily from year to year, prompting the researcher to urge that the bank use this information to plan for the future and develop additional services by appointing data scientists.

In this study, important insight information was found that mobile banking transaction activity is directly related to business transaction activity of the customers daily, monthly, and yearly so that the researcher recommends that the bank work on target marketing strategy in promotion time. Additional insight generated from the study was some of the districts of the bank have an unexpected number of customers so that the researcher recommends the bank take this insight to aid the business decision-making and deliver values.

This research found that the usage pattern of customers was varied across the months so that the researcher recommends the bank should prepare customer behavior profiles based on months with a higher and lower number of customers.

In this study, the researcher recommends the bank make a trend analysis of mobile banking customers annually to plan to increase the number of customers.

This study, found males have a better understanding and practice of the mobile banking service than females so that the researcher recommends the bank motivate female customers through the different incentives and promotional schemes to maximize the number of female customers.

The study also found the number of customers in the district of Dessie and Shashemene was the least among the districts of the bank so that the researcher recommends the bank work on addressing potential customers of the bank who are subscribed to have an account through target marketing strategy about these districts.

In addition, the study found that the amount of money transferred through mobile banking was found to range from 1 birr up to 200000 birrs but unlimited and in one day about 97 million birrs could be transferred and also in a year above 834 million birrs were transferred so that the researcher recommends the bank to give information for the public. This is because some customers do not have the information that it is possible to transfer a huge amount of money through a mobile banking service.

Last but not the least, the researcher suggests that Ethiopian higher education institutions and the government embrace data or big data analytics as a subject in their programs and curricula.

5.5. Limitations and further research suggestions

This study was conducted on one bank customer's data thus this study may be limited in its generalizations of the findings to whole profit-making organizations of the country. so, future research should have to be studied from different profit-making organizations. Moreover, the study was done only on customers data of the commercial bank of Ethiopia which is a state-owned bank, it can be extended to other private banks' customers for comparing and generalization of the results.

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