A Model-Driven Approach for Online Banking Application Using AngularJS Framework

Diptiben Ghelani[1], Tan Kian Hua[2], Surendra Kumar Reddy Koduru[3]

[1]Institute of Computer Science, Gujrat Technological University, Ahmedabad, India

[2]Management and International Business, and Cyber Security, LIGS University, Honolulu, USA

[3]Department of Information Technology, Allahabad Agricultural Institute, Allahabad, India

Email address:

shezi130@gmail.com (Surendra Kumar Reddy Koduru)

Abstract: Numerous web apps, such as online banking, gaming, and online ticket reservation, are now used by people all over the world. Existing web apps feature a shell page that is wasteful and unresponsive due to its slow response time and rigidity. Two frameworks, AngularJS and Joomla, were merged in this manner to produce a more adaptable and responsive online application. AngularJS is a simple SPA framework that uses JavaScript code to provide data binding and a responsive formula. Joomla, a content management system, also manages the content of the online application. As a result, the results show that the method increases the web application's responsiveness and adaptability. The most intriguing revolution in computing archetype is cloud computing. However, the main roadblocks to widespread adoption are security and privacy concerns. According to Moghaddam, Wieder, and colleagues' study, the service provider's security capabilities, data sensitivity, and cloud users' requirements, as well as the notions of isolation, elasticity, and computing environment in the cloud, must all be based on a policy management scheme. Generally, it has been noticed that the usage of JavaScript in conjunction with JavaScript frameworks and libraries alleviated general issues in such applications. Along with the Model-View-Controller (MVC) structural architecture or pattern, an inventive family of JavaScript frameworks emerges.

Keywords: Java Script, Online Banking, Framework, Model

1. Introduction

Nowadays, the self-service banking system has gained widespread popularity due to its ability to provide high-quality, 24-hour assistance to customers. Internet banking focuses not just on money transfers, but also on completing a variety of financial activities in the shortest amount of time possible. With an Android smartphone and browser, every client may access his bank's website. However, internet banking is a target for numerous hacking attempts. To avoid these issues, a new model for secure internet banking with biometric recognition and SMS mobile service has been designed [1]. Once a user has been granted internet banking access, they may perform a variety of transactions, including balance inquiries, fund transfers, online bill payment, accumulated interest, fees and taxes, and transaction data for

each account. Bill payment, money transfer, mobile phone recharging, online applications, online purchases, and account maintenance are all examples of banking services. To access current online banking, users must first register with the bank, after which the bank will assign a user ID and password (IPIN) to the customer. The user may then log in using their user ID and password on the bank's website. If the user provides the right user ID and password, he or she can utilize online banking to access his or her bank account. Some banks provide additional authentication methods, such as sending a security token code to the user's mobile phone via SMS message [2].

AngularJS, as well as other web frameworks such as ReactJS, KnockoutJS, and PolymerJS, have recently been developed for dynamic web application development. These frameworks gained popularity by including principles like as data binding, templating, routing, single-application pages,

MVC, and others [3]. These notions save the developer from creating boilerplate code, making it easier to design JavaScript applications that need quick delivery of the final result to the consumer [4]. The finished product must pass a particular degree of quality assurance before it can be provided to the end user, regardless of how quickly they can be learnt and applied [5]. The difficulty can be solved by enabling continuous integration of tests with source code. Jasmine, Mocha, and Coffee are a few web frameworks for testing apps. Jasmine was chosen due of its readability and connectivity with other testing tools. Jasmine tests are made up of suites and specifications. This block also includes matchers that compare test results, also known as real values, to some expected values. Because simple string descriptions inside specs and suites explain the essential functionality of the tested module, documentation is straightforward to write after test execution. It is necessary to be familiar with the AngularJS framework in order to fully comprehend the testing approaches given in this paper. The Model View Controller pattern is used in the software architecture of AngularJS applications [6]. This implies that every AngularJS application has the following components: x Model x Model is the lowest level of the pattern and is responsible for data maintenance. x View is in charge of showing the user all or a piece of the data. It's also referred to as an HTML template in text. The Model and View interactions are controlled by the x Controller [7]. Every AngularJS application begins with the creation of a controller that controls the model via a view that is updated whenever the model is changed. As a result, the data on the page is refreshed without having to reload the entire page. This is accomplished by using event listeners as watchers. A digest cycle is initiated every time a watcher is activated, and the page is updated with new data. This is an important factor to consider while creating an effective application. In the next chapters, each testing approach will be described together with the tool that will be used to test an AngularJS application. In chapter three, you'll learn about methods and techniques for improving your AngularJS application. The findings of each tool are included in the descriptions of application optimization approaches [8].

Information distribution, whether on the internet or through other devices, is a critical foundation in any company, institution, or society that requires attention and correct management in order to improve communication. According to Azodolmolky, Wieder, and Yahyapour, cloud computing has emerged as a widely recognized computing archetype based on foundation concepts such as virtualization, dispensation control, flexibility, allocation, and connection that are integrated to provide a collection of information technology resources distributed over a global network [9]. People have become accustomed to share news and ideas online thanks to social networking sites like as Bloggers, Facebook, Twitter, Instagram, and others. According to prior work by Mishne, Tsagkias, Tatar, and Hong, high-quality resources are available to find public attitudes and popularity recognition of numerous themes and

situations. This sort of ability is vital to relevant authorities because it can take appropriate steps in time to prevent the spread of bad opinions that may affect images. The research resulted in real-time and well-known information sources being shared inside an institution or group [10]. Zheng and Litvinov contrasted measured studies and elaborated on the relevance of real-time information transmission in their study on real-time ex-post pricing marketing. Other distinguishes between the ex-post price and support price of individual resource current and definite responses in terms of measure. Similar to commercials, announcements, and other critical information transmission objectives in various public locations, displays are required for a variety of reasons [11].

The use of dedicated equipment or microprocessors in community places in cooperation through light-emitting diode or liquid crystal display monitors is a common and significant technique for expanding these displays. Furthermore, content management presentations are critical in conveying the intended information to the public. It is for this reason that people have ordered space in order to create definition. Kang et al. investigated a novel user interface for administering or controlling items on a multimedia dynamic design bulletin board [12]. They created a prototype to examine the use of fixed and dynamic layouts in bulletin board multimedia. research focuses on the issue of planned information being distributed in Higher Education in the Philippines' Province of Laguna. The existence of personnel interactions, location, and the hectic schedules of those engaged are all issues that arise. Materials for developing or upgrading bulletins must be planned in accordance with the desired design. Then, after planning the bulletin board, a design budget must be created before the bulletin can begin to be updated [13]. There are also times when those responsible for maintaining the bulletin board are busy or unavailable when an urgent posting or change is required. Furthermore, when updating the bulletin board, a typographical error may occur, resulting in miscommunication owing to misunderstandings in the material provided [5]. Furthermore, conventional bulletin boards face issues such as scratches, destruction, and damage caused by a few disorganized persons [14].

In keeping with this, the study's objectives are as follows: 1) to develop an electronically organized and simple management system for updating and publishing information on bulletin boards, specifically to develop an electronically organized and simple process for adding and updating published information on bulletin boards with accounts privileges on system users for validity option and review comments and message filtering regarding submitted posts by staff or faculty members, even when the individuals concerned (2) to develop a content management system for a more creative design template or backdrop, and to input required information for the bulletin board, such as news, activities, upcoming events, and other relevant updates, with less labor participation; (3) to create reports to determine the efficacy of the Cloud-based Real-time Bulletin Board in terms of the number of times the system bulletin has been seen and the rate of viewer response on the announcements; (4) to include the Angular JS Framework into

the system's development; (5) to create a mobile app that allows users to conveniently manage posting and notification; and (6) to assess the system's adherence to ISO 9126-1 requirements. The research is necessary for the academic transmission of key information such as school activities or events, Dean's listers, test timetables, and many other items that are shown or put on an LED Monitor as a medium for electronic bulletins. By minimizing paper consumption and waste from utilized items in the traditional bulletin board, the system can help conserve forests [15]. Nowadays, publishing and disseminating key information is extremely important since information must be vetted, thoroughly examined, and released on time. Furthermore, with the aid of the system, only the legible folks will be permitted to spread information, ensuring the information's legitimacy and validity. Additionally, publishing and updating the bulletin board may be done through mobile, tablet, or computer even if the person in charge is not in the neighborhood, as long as they have an internet connection. Finally, the study intended to improve earlier information transmission by making it more appealing and thereby attracting the attention of everybody who sees it [16].

2. Literature Review

Net Banking, or Internet Banking System, is a popular technology that allows consumers to use mobile technology to conduct a range of personal and company financial transactions and banking tasks. The term "net banking" refers to banking transactions that take place through the internet. However, there are several security issues, such as fraudulent websites, phony bank emails, collecting user IDs and passwords, stealing personal bank accounts and ATM cards, and so on. Individual security and authentication are essential in our daily lives, particularly in online banking. The use of biometric verification techniques such as fingerprints has enhanced it. This study presents a mobile security solution based on a novel paradigm that includes biometric identification and SMS service [17]. A typical website, such as a social networking site, used to consist of static websites and an online brochure with text and graphics. To communicate with the firm and learn more about the service, the customer must write an email or look for the toll-free phone number for technical assistance. However, with more bandwidth and changing visitor expectations, the internet has evolved dramatically. Finally, outdated static webpages slow down the user's experience [18]. They take time to load the website and reply to the user each time they do so. Furthermore, the user's expectation is that the one who is in the market is updated and globalized. AngularJS is a new JavaScript toolkit that was released in the middle of 2012. It has already gained popularity among web developers and UI engineers, ranging from small businesses to large corporations. While commercially available support, the ability to utilize existing Java developers' help, and other considerations promote the adoption of most JavaScript frameworks for business applications, instead of building jQuery implementations, the AngularJS framework makes it very easy to display a web application by simply changing the HTML elements and adding some java methods to execute it. AngularJS also has a test framework [19].

Developers may use this framework to save time and effort while testing their applications. In addition, the exam has a high level of validity and reliability. Because it contains pattern implementations for both controllers and view-models, AngularJS is a flexible client-side MVC/VM framework (IMO). Client routing, templating, data modeling, app configuration, logic containers, and service hooks for interfacing with the outside world through AJAX or REST are among the structural elements it provides. With each version, the AngularJS team adds additional application functionality, boosting its developer usefulness. It's a framework for creating dynamic web applications. It enables the usage of HTML as a template language and aids in the extension of HTML's syntax in order to represent the application's components simply and concisely. Data binding and dependency injection in Angular is minimize the need to write a lot of code. And because it everything happens in the browser, it's a great companion for any server technology [20].

If HTML had been developed for apps, it would have been Angular. For static texts, HTML is an excellent declarative language. It does not feature much in the way of application development, making it difficult to create web apps Joomla is a content management system (CMS) for publishing web content that is free and open-source. It's based on the model–view–controller web application framework, which may be utilized without the CMS. Joomla is written in PHP, employs object-oriented programming (OOP) techniques and software design patterns (since version 1.5), stores data in a MySQL, MS SQL (since version 2.5), or Postgre SQL (since version 3.0) database, and includes features like page caching, RSS feeds, printable versions of pages, news flashes, blogs, polls, search, and language internationalization support. Many businesses and organizations have needs that go beyond what the basic Joomla package can provide. In those cases, Joomla's powerful application framework makes it easy for developers to create sophisticated add-ons that extend the power of Joomla into virtually unlimited directions [21].

2.1. Cloud Computing

According to Rahman and Devi's research, social networking sites are created as static web pages with text and picture brochures. In comparison to the past, the internet has progressed to better in every aspect, with higher capacity; online visitors' prospects and expectations have altered. It has been said that old static web pages' increase user discontent due to the time it takes for sites to load and reply to users. Furthermore, real-time market updates and globalized technology are recognized as consumer expectations for a better company, particularly when assessing the firm's websites in terms of responsiveness among the users. However, because cloud computing is known for its rapid growth in providing noticeably scalable and virtualized information technology resources, new cloud security controls are required [22]. This stems from the reality or truth

that cloud computing is the union of numerous in different industrialized areas, including virtualization and service-oriented structural design, as stated in Faraz, Moghaddam et al study's The basis of scripting technology has largely transformed static Hypertext Markup Language sites into dynamic innovative, user-interactive displays. Furthermore, Chaves, Westphall, et al. said that one of the most difficult and pressing concerns in internet clouds is virtualizing infrastructure while maintaining an acceptable or adequate degree of security. Each cloud user, without a doubt, need a dependable level(s) of security based on the information described by the Standard Layered Approach [23]. There are various methods that aim to categorize the level of security in cloud-based settings. According to Yildiz, Abawajy, and colleagues' study, the categorizations were based on security restrictions or the definition of a security policy. The most intriguing revolution in computing archetype is cloud computing. However, the main roadblocks to widespread adoption are security and privacy concerns. According to Moghaddam, Wieder, and colleagues' study, the service provider's security capabilities, data sensitivity, and cloud users' requirements, as well as the notions of isolation, elasticity, and computing environment in the cloud, must all be based on a policy management scheme [24]. Individuals and businesses must keep and exploit their communications, health information, tax records, photo albums, financial deals, and other data. Ren, Wang, and their colleagues say they're encouraged to outsource their local complicated systems data management to the cloud because of its flexibility and cost-effectiveness. However, once people or persons no longer own their data physically, the data's trustworthiness and secrecy are jeopardized. The most general method for resource privacy protection and to decrease or prohibit manipulation on both sensitive and non-sensitive information, according to Chhetri et al's study, is to describe each cloud node's security rules as declared needs and sensitivity. In this regard, the researcher employs such concepts in order to create a flexible and responsive database as well as a secure information dissemination management system for successful communication in a community or institution [25].

2.2. Real-time Bulletin Posting

According to Tsagkias et al., the information has been delivered and improved by using accurate textual information before publishing on various news media, using a two-stage binary classification method to analyze and predict the volume of comments to classify articles with a high potential for comments. Some peer-reviewed papers, such as the eCampus project in the work of Storz et al., Santos et al., and MAGIC Broker Erbad et al, implemented their prevalent and interactive displays as servers through dedicated machines to accumulate and illustrate contents with the application of Faculdade de Ciencias e Tecnologia 4U [26]. (FCT4U). Then, Academic Information System, as mentioned in Pandini et alwork,.'s and MoCHA, as described in Oat et alwork,.'s employed two systems to disseminate information appropriately as a web server for hosting contents in a web browser and through a

mobile application. In comparison to committed technology that costs thousands of dollars, web servers may eventually arrive with cost-effective upkeep such as electrical energy and Internet aloft utilizing pre-existing machines, as detailed on www.wirespring.com. Heroku price said that another alternative is to hire a server host in cloud computing for a monthly cost of as little as $0 - $50, wherein the research employs the cloud-based system to save costs and ensure that the system runs efficiently. Furthermore, because of the fast adaption of more and more nations on mobile, past user engagement literary apps on mobile were picked [27]. The Android platform was chosen because of its built-in compatibility with the Chrome cast and high market share. According to Song et al., the App Quality Alliance established rules in June 2013 and formed the primary foundation in the research of their application to depict the many application characteristics based on responsibilities outlined in building Android interfaces. Icons8's Graphical resources were used for the effectiveness of system interaction evaluation, in the study of Alt et al. shiu et al. 2004 the use of site deployment for user acceptance test, animations were used in a study of Osman et al. 2003 questionnaires on Yong's work concentrated on essential parameters, and constrained usability tests for time were used in a study of Hussain et al. shem et al., 2008 based on us The publishing of notifications such as news or upcoming activities or events in real-time or on-time is crucial in order for all users to be attentively informed and plan ahead of time [28].

2.3. AngularJS Framework

JavaScript is a contemporary web development and programming language that is used to construct a variety of systems with improved user interfaces. Generally, it has been noticed that the usage of JavaScript in conjunction with JavaScript frameworks and libraries alleviated general issues in such applications. Along with the Model-View-Controller (MVC) structural architecture or pattern, an inventive family of JavaScript frameworks emerges. AngularJS, Ember.js, and Backbone.js are some examples; AngularJS is validated in the AngularJS API documentation and the work of Ramos et al., which is created and maintained by Google, is the most widely used framework. Since 2013, the detail has been established by distinguishing the amount of most in Google searches queried framework every month in Stack Overflow, as displayed and explained on one of the figures in Ramos et al study. Furthermore, the AngularJS framework was employed in the system's development. Angular is one of the most contemporary web frameworks, along with Reacts, Knockouts, and polymers, which are used for dynamic web application development and are reviewed in the Comparison of JavaScript application frameworks [29]. These frameworks gained popularity through the use of databinding ideas, templating, single-application page characteristics, MVC, routing, and other features. With these notions, developers are freed from creating boilerplate code, enabling the creation of JavaScript apps that require speedy final product release to clients or customers. Furthermore, without JavaScript frameworks, it is a challenging issue since static typing, type checking assembly, and support for Integrated

Development Environment are not available. Regardless of how quickly they may be created and implemented, the final product or output must pass a degree of defined quality assurance before it can be provided to the end user. The study employed AngularJS as its framework on a host server, which was available in a platform, as in prior studies, via mobile applications or browsers on a PC, laptop, or tablet. The AngularJS framework was picked because of its responsive formula and quick or real-time updating of any modifications planned on the cloud-based bulletin [16]. Furthermore, AngularJS is a simple SPA framework with extra javascript codes that give data binding and responsive formula for the application [30].

AngularJS improves usability, design visualization, user understanding, and content creation while developing a website or system, where information is one of the five primary categories of resources, according to Mcleod and Schell (2001). As a company's or institution's computer capabilities improve and become more complicated, the importance or need of information management grows. Furthermore, AngularJS has a test-driven framework, which saves developers time and effort when it comes to application testing. According to Rahman and Devi's research, testing and assessment have a high validity and reliability. In line with this, the researcher uses the AngularJS Framework to increase code reusability, which allows developers to reuse written code to save time and effort, as well as to improve server speed by enabling caching and other operations [31].

The automated teller machine (ATM) is a mechanical device with its origins in a banking institution's accounts and records. Many established banks in industrialized nations started with ATMs and progressed to Personal Computer Banking, Telephone Banking, a is a result of new entrants, electronic services, and increased security for financial systems when it comes to e-banking. Khorshid and Ghaneh [2009] did a study on the obstacles of e-banking and highlighted issues such as user privacy, security, and gaining client confidence. The main hurdles for the growth of Internet banking on the client side stem from reputation,

legislation, and regulations. To avoid all of these unintentional losses, banks and other organizations could use biometric security, and all of our concerns might be alleviated. A biometric security system simply allows you to identify yourself by your intrinsic biological traits such as your eye or finger prints. As a result of its dependability, fingerprint recognition is frequently utilized. It is commonly utilized in forensic and commercial applications such as criminal investigation, ecommerce, unique ID cards [32].

Figure 1. Fingerprint machine.

Fingerprint identification is based on imprints created by distinct ridges on the fingertips. Fingerprint pictures were scanned and improved before being transformed into a template. For minutiae matching, the majority of automated systems employ finger print recognition. The term minutiae refer to the break in the ridges, bifurcation, lake, and termination in an uneven pattern. In general, ridge terminating and ridge bifurcation are employed to identify fingerprints.

Fingerprint identification is based on imprints created by distinct ridges on the fingertips. Fingerprint pictures were scanned and improved before being transformed into a template. For minutiae matching, the majority of automated systems employ finger print recognition The term minutiae refer to the break in the ridges, bifurcation, lake, and termination in an uneven pattern. In general, ridge terminating and ridge bifurcation are employed to identify fingerprints [33].
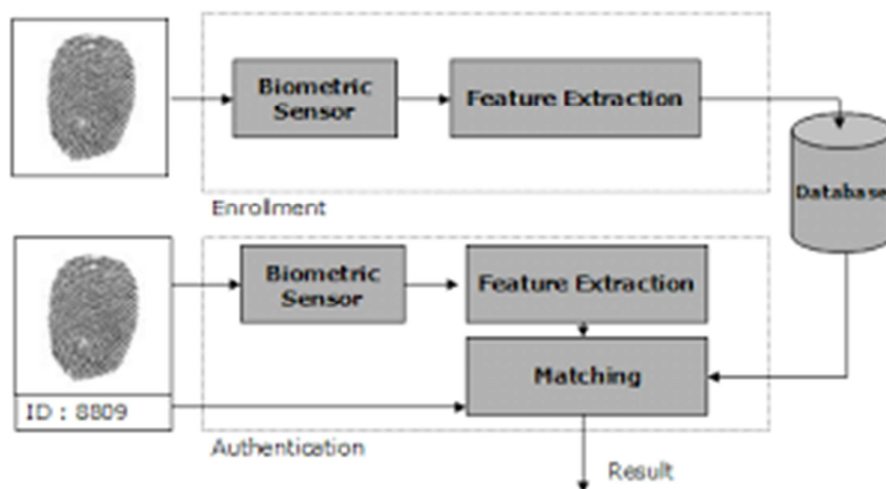

Figure 2. Registering a person in a biometric system.

An attacker can hack into the websites that reside on a financial institution's network using advanced programming skills. Using this, he may get access to the bank's systems in order to identify the ATM database and so acquire card information that can be used to manufacture a clone card later. A biometric system recognition gives more accuracy and confidentiality than a PIN. When a customer comes into the branch to create an account, he is requested to fill in the blanks with the questions. In addition to the questions, fingerprint pictures are gathered in the branch [34].

3. The Existing Method for Net Banking

Internet banking refers to a specific set of technical solutions for the creation and delivery of financial services that rely on the Internet's open architecture. With the adoption of an Internet banking system, banks retain a direct interaction with end customers over the web and are able to give a personalized interface by providing extra customized services. Figure 3 depicts Internet Banking Security (IBS); the user must first provide a User ID and password, which will be validated on the bank's website before authorisation is granted. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." If the user is valid, the user can access internet Banking processing such as balance enquiry, transfer of funds, online bill payment, accrued interest, fees and taxes, transaction details of each account, accounts, credit card and home loan balances, transfer funds to third party accounts user nominate, and open a deposit right from the terminal [35]. Finally, the transaction information are saved in the Database:
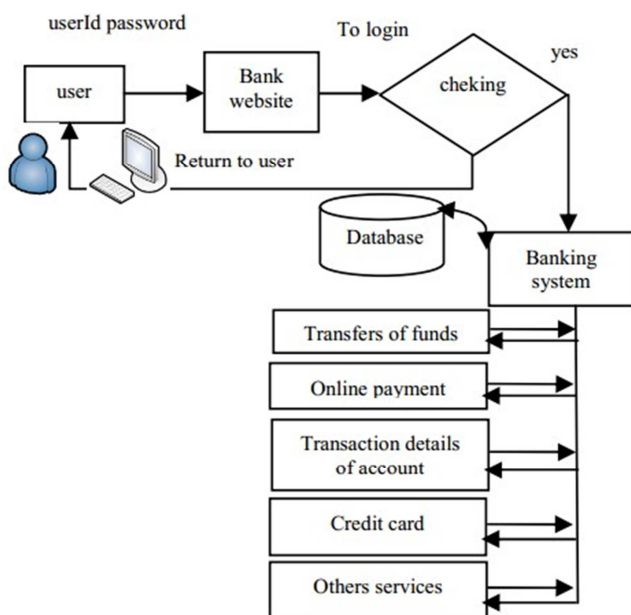

Figure 3. Existing model for Internet Banking system.

Another method for securing online banking includes the use of a pin number with a mobile code. This validation bank offers other authentication methods, such as sending a security token number to the user's mobile phone through SMS. To conduct a transaction with online banking web applications, for example, the user must identify themselves using a valid login and password. Following this transaction request, the user receives an SMS message with the One-Time Passwords OTP, which must be entered separately to authorize the transaction. In this context, the OTP is referred to as a mobile Transaction Authorization Number (mobile TAN or mTAN). The online service transmits the OTP to the user's mobile phone over the cellular network, and the user inputs the OTP to authenticate or approve a transaction [36], as shown in Figure 4.

Figure 4. SMS OTP Principle: The OTP is generated by the service provider and sent to the mobile network operator (MNO) that delivers the OTP via SMS to the user.

3.1. Using a Smartphone for Biometric Authentication

Among the numerous biometric systems, the ones based on fingerprint matching are the most popular in terms of accuracy and dependability. In Figure 5, the layout for sensors, such as a fingerprint sensor, may be integrated into an existing smartphone. This makes the manner of identification more appealing and simple. Fingerprint identification has expanded in civil and criminal enforcement applications due to its unique identity and simplicity of access [37].
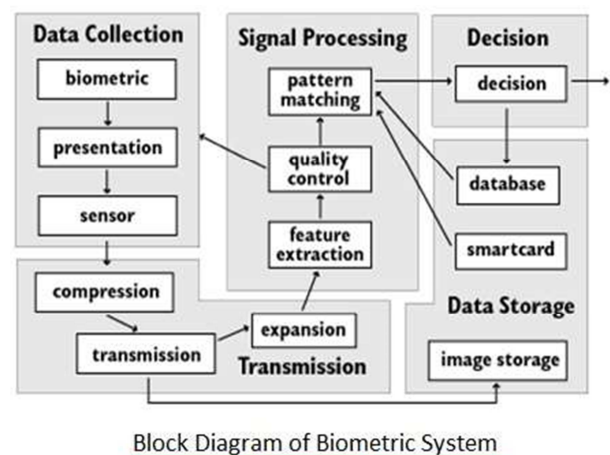

Figure 5. Block diagram of Biometric Process by a smartphone sensoring.

The goal of this research is to detect security in mobile banking and to propose a biometric authentication technique for mobile banking transactions.

3.2. Proposed Method of Internet Banking

To be able to utilize the broker, each group bank must subscribe to the services offered. The bank system includes a module that was created to illustrate the full integration of the proposed authentication technique. This module is an account management system used by the bank's employees (AdminBank) to carry out administration tasks such as opening new accounts, configuring account data and security settings, adding an extra holder to an existing account, and registering users' fingerprints. In Internet Banking, the user must first submit a User ID and password, which will be validated on the bank's website before authorisation is granted [38]. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." Simultaneously, the user scans his fingerprint with a scanner and checks the fingerprint feature extraction and matching procedure. The fingerprint picture should match the fingerprint in the banking database. Following that, the consumer can have access to the interface Manager customer bank ATM. When a consumer loses his ATM card, he can block it. During the registration procedure, a one-time password is produced if the fingerprint recognition is successful. For authentication, the password is delivered to the user's cell phone number. Following validation, the user may access the interface Manager customer and begin the transaction. Finally, the transaction information are saved in the Database [39].
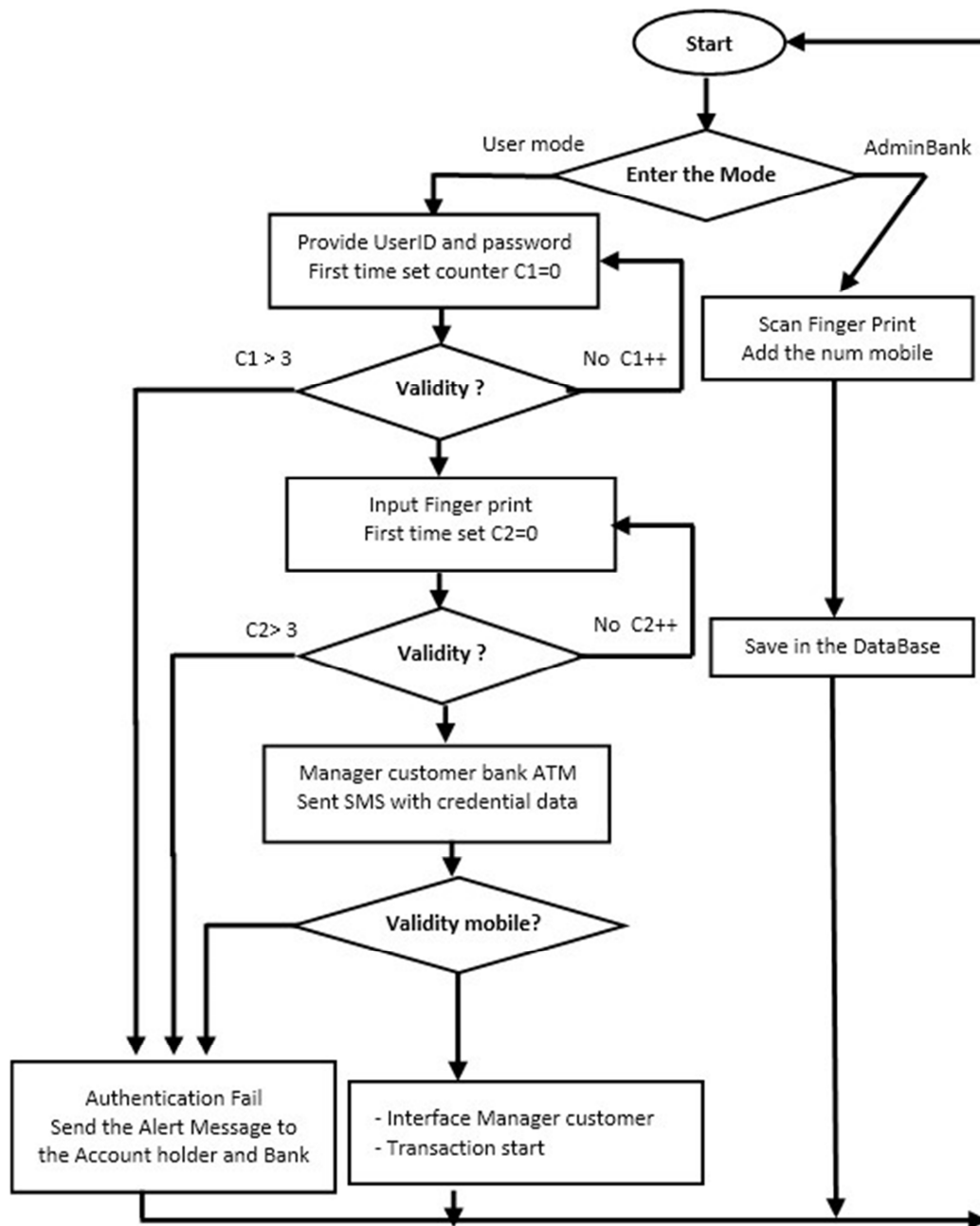

Figure 6. Architectural diagram of the proposed Net Banking system.

3.3. Algorithm of Proposed Model for Internet Banking System

Connect personal system bank website by a smartphone
1. [Entering into Internet Banking System].
2. [SET banking user id, password].
3. [Validate user ID, password].
If bk user id:= user id and bk passwd:= password
Then Enter into Internet Banking System Else:
Write: invalid user;
4. [Finger print recognition].
5. [Scan finger print] Read: fingerprint; 6. [Retrieve finger print].
Set USER fingerprint:= fingerprint;
6. [Validate finger print].
For i: = every valid user in system, do
If db[i]. fingerprint = USER fingerprint Then
Enter into interface Manager customer bank ATM;
If card ATM is loosed check option blocked card;
[end if].
password is sent to the user's mobile number for authentication;
Else
Write: invalid user
[end if].
[end for].
7. [Validate SMS Mobile].
Enter into Interface Manager customer;

Start transaction;
8. Exit

This algorithm can be used to develop a various number of applications for control access, internet banking or anything else that requires a great level of security.

3.4. Architectural and Comparison of Existing Method and Proposed Model

For a net banking architecture, the J2EE platform provides a multitier distributed application model, the flexibility to reuse components, a consistent security model, and flexible transaction control. Figure 7 depicts two multitier J2EE applications, each of which is separated into the tiers mentioned in the following list. J2EE application components are shown in J2EE Components:

Client-tier components are executed on the client's system.
a) The J2EE server hosts the web-tier components. - For the Net Banking process, business-tier components execute on the J2EE server [21].
b) The EIS server hosts enterprise information system (EIS)-tier software.

Our J2EE design includes additional modules integration for safe Net Banking process to leverage security. To verify that users have access control privileges, the Java Authentication andAuthorization Service (JAAS) may be used to authenticate and authorize them (permissions) [40].
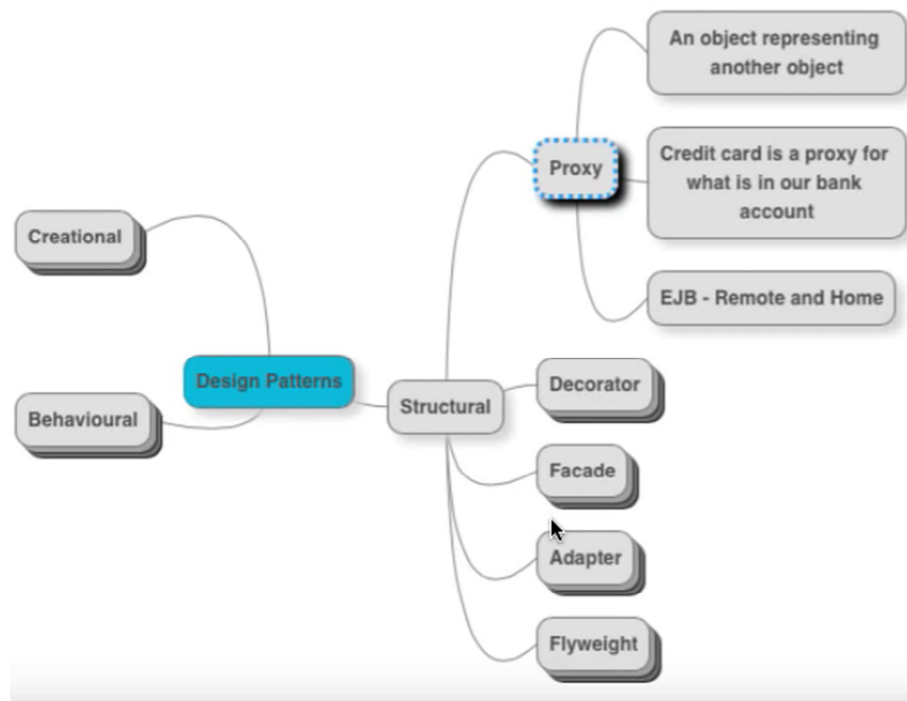

Figure 7. J2EE Design Patterns for the Net Banking Architecture.

Figure 8 depicts how they all collaborate to handle an authentication request. To begin, the sequence diagram below depicts the class interaction that happens during successful authentication and highlights important players and their actions. The Client wishes to gain access to a secure J2EE application. The J2EE application validates the requests using the JAAS authentication Modules before initiating authentication by passing the request to the biometric

authentication server and checking mobile OPT validity.

Figure 8 depicts how they all collaborate to handle an authentication request. To begin, the sequence diagram below depicts the class interaction that happens during successful authentication and highlights important players and their actions. The Client wishes to gain access to a secure J2EE application. The J2EE application validates the requests using the JAAS authentication Modules before initiating authentication by passing the request to the biometric authentication server and checking mobile OPT validity [41].
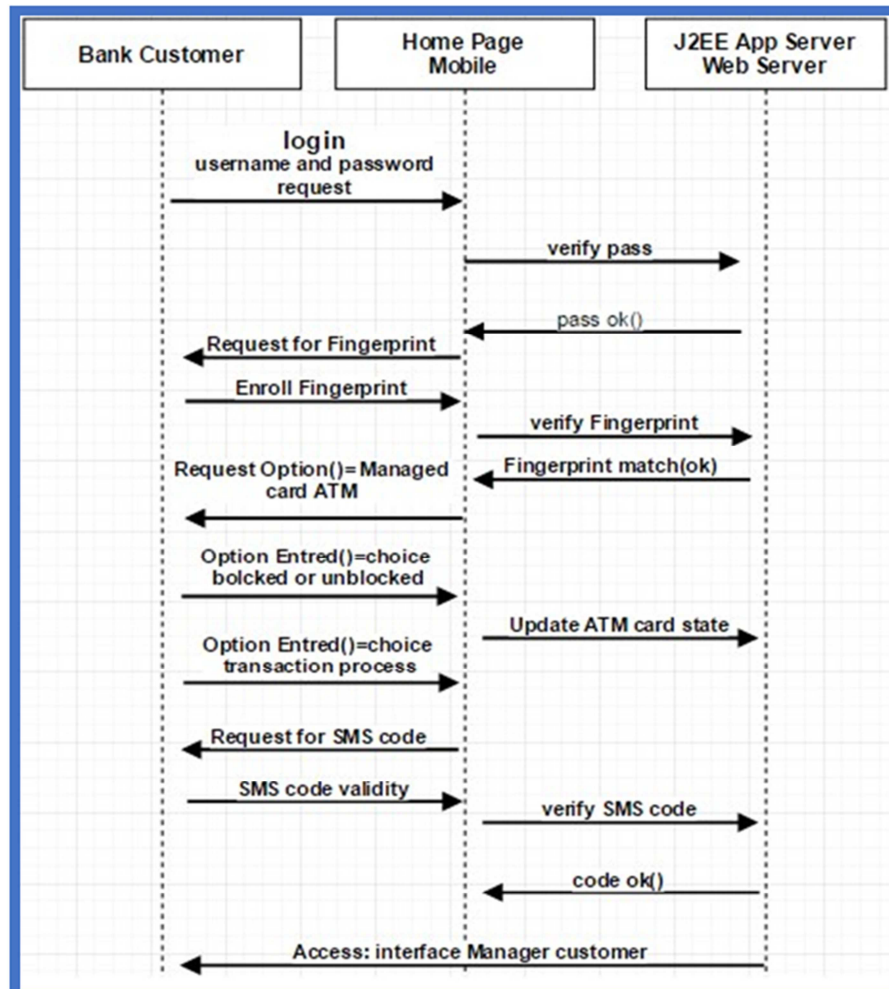

Figure 8. Sequence Diagram authentication process.

One of the primary issues with online banking user authentication is the inherent lack of security of traditional authentication approaches such as passwords, PIN numbers, and cookies. The prospect of identifying someone online has been addressed with the present development of biometric technology and the mobile validity market. Our design enables a validation check to be included in a web page by using objects contained in the web page. Even if the cell phone and card are lost, the attacker is hampered at several stages in the suggested strategy [17]. This gives the consumer enough time to become aware of the problem and instantly disable the ATM card himself or herself. The system has the significant advantage of ensuring security in the event that both the card and the mobile phone are lost [2, 3]. Even if the cell phone and card are lost, the attacker is hampered at several stages in the suggested strategy. This gives [5] the consumer enough time to become aware of the problem and instantly disable the ATM card himself or herself. The system has the significant advantage of ensuring security in the event that both the card and the mobile phone are lost.

Furthermore, the proposed method does not necessitate any changes to the J2EE system's infrastructure. Because we are living in the age of mobile banking, the suggested solution may be simply incorporated into mobile applications that support the J2EE banking system. All that is required here are minor modifications to the mobile application and the addition of some new features to the previously existing web service. As a result, the solution is cost-effective. The integration of a mobile phone into the J2EE system improves security. Anyone with a user id and password can access Net banking using a single authentication mechanism. As a result, it is not a secure authentication technique. As a result, a dual authentication system is preferable than a single authentication system [42].

The bulk of fraud actions are committed by insiders. Because an insider may simply hijack a user's account,

password, and mobile SMS. Insiders are typically family members, coworkers, or members of a neighboring gang. Through finger print recognition, fingerprints have become an essential tool for identifying complicated crimes. As a result, it is a more secure model. Users' fingerprints cannot be utilized elsewhere without the user's knowledge [19]. The user should scan his fingerprint in this architecture. However, not all systems have System of single authentication:

The user provides his or her user ID and password, which will be validated on the bank's website before authorization is granted. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." The user provides his or her user ID and password, which will be validated on the bank's website before authorization is granted. Simultaneously, the user scans his fingerprint using a smartphone and checks for matches.

For permission, a biometric authentication and mobile validity market are validated on the bank's website.

Otherwise, the user receives the message "Invalid user."

The user inputs a User ID and password, which are subsequently validated on the bank's website for permission. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." • Following this validation, the bank will do additional authentication steps, such as sending

another security token number to the user's smartphone through SMS. By default, peripherals are scanned. As a result, any system or laptop must include scanning capabilities. Users can utilize extra accessories for fingerprint scanning on computers that are currently in use. This fingerprint authentication method is already in use in ATMs. This type is used by many departments, not only ATMs. However, net banking is the most popular and money-oriented group [20]. Nobody can guarantee completely safe ways for this process in internet banking [43]. Moreover the proposed solution does not demand any change in the infrastructure of the J2EE system. Since this is the era of mobile banking, the proposed solution can be easily integrated into the mobile applications that enable J2EE banking system. All that is needed here is some add-ons to the mobile application and inclusion of some extra functionality to the already existing web service. Hence the solution is cost-effective. Here security is improved by integrating mobile phone into J2EE system. For a single authentication system, anyone can hack user id and password and also they can access the Net banking. So it is not secure authentication method. So a double authentication system is better than single authentication system. Insider is most responsible for the majority of fraud action. Since insider can easily hack username, password as well as user mobile SMS also. Mostly insider may be family members, colleague or nearby gang [42].

Table 1. Existing and proposed model in AngualrJS model.

Existing Method	Proposed model
Single authentication system: The user provides his or her user ID and password, which will be validated on the bank's website before authorization is granted. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." Double authentication system: • The user provides his or her user ID and password, which will be validated on the bank's website before authorization is granted. If the user ID and password are correct, the user can access the internet banking system. Otherwise, the user receives the message "Invalid user." • Following this validation, the bank will do additional authentication steps, such as sending another security token number to the user's smartphone through SMS.	The user provides his or her user ID and password, which will be validated on the bank's website before authorization is granted. Simultaneously, the user scans his fingerprint using a smartphone and checks for matches. For permission, a biometric authentication and mobile validity market are validated on the bank's website. Otherwise, the user receives the message "Invalid user."

Application Execution Right-click and execute your AngularJS blog application in NetBeans. You should see the same data that was displayed on the screen when the data was hardcoded. If you are using Chrome as your browser, you may enable "Developer Tools" and navigate to the "Network" menu button to examine the REST service calls that are made as you navigate through the application. In Developer Tools, you can also examine precise information about each service call by clicking the Headers, Preview, Response, and Timing tabs. If you have problems with AngularJS REST service requests, using Chrome Developer Tools is a wonderful approach to troubleshoot them. A fantastic JavaScript debugger is available for debugging REST service requests and other JavaScript difficulties. If you are unfamiliar with Chrome Developer Tools, you may learn more about them on the Google Chrome website. NetBeans has a debugger for debugging JavaScript applications in addition to the Chrome debugger. Visit the NetBeans website for further information about debugging

JavaScript in NetBeans. Karma Testing Services Karma is the greatest tool for testing AngularJS services [43].

4. Conclusion

To avoid plagiarism, typographic and grammatical problems, and other issues, the proposed system was designed to safeguard, check, and validate material before it is allowed for publication. Furthermore, the system will not only reduce the amount of paper used, the amount of time spent, and the amount of effort expended by personnel just to update and improve the design of the bulletin, but it will also include modules to determine the effectiveness of the bulletin in terms of the audience's or viewer's insights and interest in the information published and disseminated. Future researchers might improve the system by incorporating template elements for other desired events. Then, researchers can concentrate on the creation of the content management structure of submitted and published posts with a summary of

review comments in order to track the author's progress. Furthermore, other researchers may concentrate on the creation of mobile applications by including modules such as design and report management in order to make them more responsive, effective, and simple to use. The study demonstrated and exposed the significance of real-time, accurate, and secure information distribution, as well as the rapid advancement of technology, in order to have better and more effective communications.

References

[1] Mannan, M. and P. C. Van Oorschot. Using a personal device to strengthen password authentication from an untrusted computer. in International Conference on Financial Cryptography and Data Security. 2007. Springer.

[2] Schechter, S. E., et al. The emperor's new security indicators. in 2007 IEEE Symposium on Security and Privacy (SP'07). 2007. IEEE.

[3] Hammood, W. A., et al. A review of user authentication model for online banking system based on mobile IMEI number. in IOP Conference Series: Materials Science and Engineering. 2020. IOP Publishing.

[4] Joshi, Y., et al. PhishGuard: a browser plug-in for protection from phishing. in 2008 2nd International Conference on Internet Multimedia Services Architecture and Applications. 2008. IEEE.

[5] Tiwari, A., et al., A multi-factor security protocol for wireless payment-secure web authentication using mobile devices. arXiv preprint arXiv: 1111.3010, 2011.

[6] Wu, M., R. C. Miller, and G. Little. Web wallet: preventing phishing attacks by revealing user intentions. in Proceedings of the second symposium on Usable privacy and security. 2006.

[7] Ives, B., K. R. Walsh, and H. Schneider, The domino effect of password reuse. Communications of the ACM, 2004. 47 (4): p. 75-78.

[8] Yee, K.-P. and K. Sitaker. Passpet: convenient password management and phishing protection. in Proceedings of the second symposium on Usable privacy and security. 2006.

[9] Herzberg, A., Why Johnny can't surf (safely)? Attacks and defenses for web users. computers & security, 2009. 28 (1-2): p. 63-71.

[10] Dorta, M., Angular JS paso a paso. MJ Dorta, Angular JS paso a paso. Leanpub, 2014.

[11] Baida, R., M. Andriienko, and M. Plechawska-Wójcik, Perfomance analysis of frameworks Angular and Vue. js. Journal of Computer Sciences Institute, 2020. 14: p. 59-64.

[12] Wohlgethan, E., SupportingWeb Development Decisions by Comparing Three Major JavaScript Frameworks: Angular, React and Vue. js. 2018, Hochschule für Angewandte Wissenschaften Hamburg.

[13] Uluca, D., Angular for Enterprise-Ready Web Applications. 2020: Packt Publishing Birmingham.

[14] Kirda, E. and C. Kruegel. Protecting users against phishing attacks with antiphish. in 29th Annual International Computer Software and Applications Conference (COMPSAC'05). 2005. IEEE.

[15] Teraguchi, N. C. R. L. Y. and J. C. Mitchell, Client-side defense against web-based identity theft. Computer Science Department, Stanford University.

[16] Alsharnouby, M., F. Alaca, and S. Chiasson, Why phishing still works: User strategies for combating phishing attacks. International Journal of Human-Computer Studies, 2015. 82: p. 69-82.

[17] Das, S. and J. Debbarma, Designing a biometric strategy (fingerprint) measure for enhancing ATM security in Indian e-banking system. International Journal of Information and Communication Technology Research, 2011. 1 (5).

[18] Murigu, A. H., The usage of automated teller machines Case study: Barclays Bank of Kenya. 2008, University of Nairobi.

[19] Konheim, A. G., Automated teller machines: their history and authentication protocols. Journal of Cryptographic Engineering, 2016. 6 (1): p. 1-29.

[20] Ahkouk, K. and M. Machkour, Towards an interface for translating natural language questions to SQL: a conceptual framework from a systematic review. International Journal of Reasoning-based Intelligent Systems, 2020. 12 (4): p. 264-275.

[21] Du, M., et al. Lifelong anomaly detection through unlearning. in Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security. 2019.

[22] Jain, H., R. Oak, and J. Bansal. Towards Developing a Secure and Robust Solution for E-Voting using Blockchain. in 2019 International Conference on Nascent Technologies in Engineering (ICNTE). 2019. IEEE.

[23] Jhala, K. S., R. Oak, and M. Khare. Smart collaboration mechanism using blockchain technology. in 2018 5th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)/2018 4th IEEE International Conference on Edge Computing and Scalable Cloud (EdgeCom).

[24] Khare, M. and R. Oak, Real-Time distributed denial-of-service (DDoS) attack detection using decision trees for server performance maintenance, in Performance Management of Integrated Systems and its Applications in Software Engineering. 2020, Springer. p. 1-9.

[25] Newman, J. C. and R. Oak, Artificial Intelligence: Ethics in Practice. login Usenix Mag., 2020. 45 (1).

[26] Oak, R., A study of digital image segmentation techniques. Int. J. Eng. Comput. Sci, 2016. 5 (12): p. 19779-19783.

[27] Oak, R., Extractive techniques for automatic document summarization: a survey. International Journal of Innovative Research in Computer and Communication Engineering, 2016. 4 (3): p. 4158-4164.

[28] Oak, R., A literature survey on authentication using Behavioural biometric techniques. Intelligent Computing and Information and Communication, 2018: p. 173-181.

[29] Oak, R. Poster: Adversarial Examples for Hate Speech Classifiers. in Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security. 2019.

[30] Oak, R., The Fault in the Stars: Understanding the Underground Market of Amazon Reviews. arXiv preprint arXiv: 2102.04217, 202.

[31] Oak, R., et al. Malware detection on highly imbalanced data through sequence modeling. in Proceedings of the 12th ACM Workshop on artificial intelligence and security. 2019.

[32] Oak, R. and M. Khare. A novel architecture for continuous authentication using behavioural biometrics. in 2017 International Conference on Current Trends in Computer, Electrical, Electronics and Communication (CTCEEC). 2017. IEEE.

[33] Oak, R., C. Rahalkar, and D. Gujar. Poster: Using generative adversarial networks for secure pseudorandom number generation. in Proceedings of the 2019 ACM SIGSAC Conference on Computer and Communications Security. 2019.

[34] Sehwag, V., et al., Time for a Background Check! Uncovering the impact of Background Features on Deep Neural Networks. arXiv preprint arXiv: 2006.14077, 2020.

[35] Ghelani, D. and T. K. Hua, A Perspective Review on Online Food Shop Management System and Impacts on Business.

[36] Ghelani, D. and T. K. Hua, Conceptual Framework of Web 3.0 and Impact on Marketing, Artificial Intelligence, and Blockchain.

[37] Hua, T. K. and V. Biruk, Cybersecurity as a Fishing Game: Developing Cybersecurity in the Form of Fishing Game and What Top Management Should Understand. 2021: Partridge Publishing Singapore.

[38] Bátiz-Lazo, B., T. Karlsson, and B. Thodenius, The origins of the cashless society: Cash dispensers, direct to account payments and the development of on-line real-time networks, c. 1965-1985. Essays in Economic & Business History, 2014. 32 (1): p. 100-137.

[39] Karamala, P. and B. D. Anchula, Does an ATM surrogate a branch of a Bank in India? Journal of Business and Retail Management Research, 2011. 6 (1): p. 90-101.

[40] Sharma, M. and A. Sharma, Role of information technology in indian banking sector. International Journal in Multidisciplinary and Academic Research, 2013. 2 (1): p. 1-12.

[41] Faith, B., Use of automated teller machines (ATM), effective service delivery and customer satisfaction in the banking sector: a case study of Stanbic Bank Uganda limited-Bushenyi District. 2008.

[42] LINDSEY, C. R., Consumer electronic funds transfer systems: Implementation in the state of texas (automatic teller machines (atm), consumer banking services). 1986, Lamar University-Beaumont.

[43] Bátiz-Lazo, B., Cash and dash: how ATMs and computers changed banking. 2018: Oxford University Press.