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Cloud & Distributed

UNIX Operating System

Comprehensive Study on Industry 4.0

Highlights

Password Authentication Technique

Blockchain based Payment Merchnat

Discovering Thoughts, Inventing Future

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Analysis of the UNIX Operating System and Improvement of the Password Authentication Technique

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I. Introduction

An operating system presents the computer user with an equivalent of an extended machine or virtual machine that makes it a lot easier to programme and make general use of the computer. This set of manual and automatic procedures also enable a group of people to share a computer installation efficiently. Most times people compete for use of physical resources such as processor time, storage space and peripheral devices; at other times people can co-operate by exchanging programmes and data on the same installation. The operating system makes these activities tolerable.

An operating system must have a policy for choosing the order in which competing users are served and for resolving the conflicts of simultaneous requests for the same resources; it must also have a way of enforcing this policy in spite of the presence of erroneous or malicious user programmes and access (Per, 1990). The simultaneous presence of data and programmes belonging to different users requires that an operating system protect users against each other. This task the operating system must perform automatically.

The UNIX operating system is a multitasking, multi-user and highly portable operating system that provides a powerful and hospitable program development environment. It controls the computer resources and provides a base upon which the application program runs. The UNIX operating system uses a hierarchical file system that is organized as a tree with the root node called "The Root" and represented by a single '/' (slash). The hierarchical file system has the 'root' file system at the top of the hierarchy of files and this file system is the key to the UNIX operating system. File systems often contain information that is highly valuable to their users. Therefore protecting this information against unauthorized usage is a major concern of all file systems with UNIX inclusive.

One of the most important security features used today are passwords. It is important to have secure, unguessable passwords.

However secure and unguessable the password may seem, it is pertinent to have in place a system that can authenticate the password whenever it is being used to log on the system.

However, the problem with passwords is that they are easily transferable with the owner's connivance and most times unfortunately, without owner's permission. Therefore, though passwords have bee and are used widely in the computer world, it is the easiest to compromise. However, the real problem with the use of passwords is that they are transferable and substantially static. Users with or without agreements can end up transferring the password to a third party who can then pretend to be the genuine user. Indeed the worst feature of all is the inability after the event to prove what really happened. There exists no simple way to determine who actually gave the password. The vulnerability of passwords is due entirely to their predictability. The adoption of procedures (authentic-cation techniques) that reduce this must form the basis of any security strategy.

a) Historical Background of Unix

The UNIX operating system was the fallout of the quest by MTT (MASSACHUSETTS Institute of Technology), Bell laboratories and the UNIX operating system's main thrust was providing a convenient working environment for programming. In addition to gaining wide acceptance, particularly in the academic

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world UNIX has influenced the design of many modern Operating Systems. UNIX has a long history as an open development environment. UNIX performs the typical operating system task, but also includes a standard set of commands and library interfaces. The building block approach of UNIX makes it an ideal system for creating new applications. The traditional operating system consists of a small kernel that runs processes such as user applications and services.

The UNIX kernel is a solid core that changes little from system to system, while processes are added at the user's discretion. This makes upgrades easier since the entire operating system does not need to be recompiled. (Thomas, et al 1996i)

b) Motivation

The major motivation for this work was that in spite of the fact that the UNIX Operating System is over thirty seven (37) years old, the UNIX operating system has continued to attain wide spread popularity. Though traditionally used on minicomputers and workstations in the academic community. UNIX is now available in personal computers. Previous PC and mainframe users are now looking to UNIX as their operating system solution.

Another feature of UNIX that motivated this work is that the UNIX implementation now includes TCP/IP and support for Ethernet. UNIX therefore provides in one package the ability to install a powerful operating system on a computer that lets user's computers through one of the most common and powerful networking protocols in the industry.

c) Our Contribution

Our major contributions in the work include the following.

1. Knowledge of the security flaws in the UNIX operating system has been highlighted.
2. Knowledge of the counter measures against security weakness of the UNIX operating system has been gained.
3. The UNIX password system has been improved upon.
4. An intrinsic knowledge of the UNIX file system has been provided.

II. Background and Literature Review

UNIX is a trademark of AT and T Bell laboratories now known as Lucent Technologies (Waran, 1993). According to the designers, the file system is the key to UNIX. It offers compatible devices, file and inter-process input/output. In essence, the user simply sends and receives data. All data are treated as strings of bytes and no physical structure is imposed by the system, instead by the data. The result is a considerable freedom from any concern for physical input/output (Davis, 1992).

UNIX is a multiple-user operating system in which commands are processed by a shell that lies between the user and the resident operating system (fig. 2.1). The shell is not really part of the operating system. The idea of a command processor that is independent from the operating system was an important UNIX innovation (Sobell, 1989).

A UNIX user communicates with the system through a shell. Essentially through a command interpreter, the shell is treated much like an application programme and is technically not part of the operating system (Sobell, 1989). This allows a user to replace the standard shell with a custom shell. The Bourne shell can be replaced with a custom shell having a graphic user interface (GUI) with icons or menus replacing traditional commands (Manger, 1992).

Among its resident modules, UNIX contains an input/output control system, a file system, and routines to swap segments, handles interrupts, schedules the processor's time, manages memory space and allocates peripherals device (Bourne, 1983). Additionally, the operating system maintains several tables to track the system's status. Routines that communicate directly with the hardware are concentrated in a relatively small kernel (Fig 2.1). The kernel is hardware dependent and varies from system to system. However, the interface to the kernel is generally consistent across implementation. UNIX is a time-sharing system with programme segments swapped in an out of memory as required (Bourne, 1983). To ensure reasonable response tune, processor access is limited by time slicing. Segmentations is the most addressing scheme, and most UNIX systems implement virtual memory techniques (Sobell, 1989).

The key to the UNIX operating system is the file. UNIX handles files as it has done since its inception in 1969, namely by allowing users' access to them from the command line. Secondly the new graphical user interface that sits atop the UNIX allows the handling of files graphically through the use of icons (Southerton., 1993).

a) General Feature of Unix File System

The UNIX file system manages all the data stored on the System's mass strong devices. UNIX provides a built-in protection system against unauthorized access to file by allowing the root or super user to assign permission to file (Southerton, 1993). From the command line, the user can determine the permission level of a file by using the "is" command (list command) to list the file and examine a coded format (Andrew, 1990).

Hierarchical Structure: The UNIX system organizes the file using an upside-down hierarchical tree structure. All files will have a 'parent' file, apart from a directory called

the 'root' directory, which is the parent of all file on the system. The hierarchical component also adds to the dynamic flexibility of the filesystem.

Structureless Files: Files are also said to be structure less, since the utility that creates the file normally dictates the internal format of that file.

Dynamic File Expression: The file-system structure is dynamic. Its size is not determined by any rule other than the amount of disk storage that is available on the system. A file size can be changed at will by the user at any time.

Security: Files are protected using file ownership mechanism. This allows only a specific class of users to access certain files.

b) The Shell and Shell Scripts

The UNIX Shell is a customized command line interpreter. UNIX commands are processed by a shell, usually, the shell starts a command as soon as it is entered and then waits for it to terminate before displaying the next prompt. The idea of a custom shell was an important UNIX innovation (Sobell, 1989). When a user logs on, the shell overlays the login, process text and data segment, but the system data segment is not affected. Thus the shell standard input, output and error files are open. The result is that the user can begin issuing commands without opening these standard files (Bourne, 1983).

Many data processing applications are run daily, weekly or at other regular intends. Some are repeated many times for example a programme treat. When such applications are run, a set of command must issued repeating the application means repeating the commands. Retyping the same commands repeatedly can be frustrating and error prone. The option is to write a shell script a shell scripts is to write a shell script is to write a shell script. A shell script is a file that consists of series of commands. The shell is actually a highly sophisticated interpretive programming language, with its now variables, expressions, sequence, decision and repetitive structure (Southern, 1993).

c) Security Issues

In the ever-changing world of global data communication, inexpensive Internet connection and fast paced software development, security is becoming more and more an issue. Security is now a basic requirement because global computing is inherently insecure. Unintended individuals may gain access to a computer and maliciously intercept, alter or transform data into something not intended.

Additionally, unauthorized access to the system may be obtained by an intruder, known as crackers, who then use advanced knowledge to impersonate, steal information or even deny the legitimate user access. Through the need to ensure security of a system is worthy, however it should be noted that no computer system can ever be completely secure. All that can be done is to make it increasingly difficult for a security compromise to occur.

Unfortunately, UNIX was not designed with security is mind, but a UNIX system can be made secure if the correct procedures are adopted. The problem of Security is UNIX's flexibility as an operating system (Pfleeger, 1989). Its versatile file-system structure allows users to browse extensively through many of the systems file. It is also commonly found that non-privileged user have access to administrative tools simply because the correct access permissions is not set on the relevant file. The issues is UNIX security can be viewed as two categories; Issues related to protecting the system from the user/owner/any multi-user system requires real security among other things protect user from greenhorns.

The most important way to safeguard a system is to limit access to dangerous functions (Wood, et al., 1983). This can be achieved by login as root only as root only when absolutely necessary and by creating administrative logins for each of the system administration functions (Southernton, 1993). Equally important is the need to ensure that the root password is known to only trusted persons.

d) File System Security

Despite very good efforts at establishing and implementing a good security strategy, the operating system can still be broken into. A cracker's goal is to ensure continued access once access has been gained by breaking a user's password it could be charged to something more secure. Another way the cracker might ensure continued access is to install new accounts on the computer. If access is gained by breaking a user's password it could be changed to something more secure. A good file system security helps prevent or detect these modifications and discovery from a break in (Lane, 1993). System configuration files may be writable by users other than the root. Also device files may have insecure file permission and programmes, furthermore, configuration files may even be owned by user other than root.

Configuration files writable by non-root account may allow a cracker to alter or changes system memory to gain more privileges, snoop terminals, or by pass the normal UNIX files protection to read files from or alter information on deal or tape storage (Smith, 1994). A cracker can alter account. This is one of the reasons most breaches of UNIX security take place at the file level because access permission settings are not set correctly when the system is installed or because file permission settings are inevitable changes a time for various reasons (Manager, 1992). The failure to reset the permission correctly leads to all kinds of security breaches. For instance the "chimed" (change mode)

command is used to alter access permission settings of a particular file or group of files. The syntax is Chimed [options] <mode> <file…..> (*).

It is ideal that a UNIX system mountains proper file system security (intension prevention), and also a means to detect unauthorized file system changes (intrusion detection).

e) File Permissions

Security in UNIX is centered on the UNIX unified file system concept. This is a concept, which treats device drivers, text files, and communications channels are being streams of data accessible via a file mane in the directory. Each UNIX file has a set of three permissions. Via:

- Owner (U) Rights the owner has to access the file.
- Group (g) Rights the owner's group have to access the file.
- World (o) Rights other users have to access file.

This information is stored as a series of flags together with the numeric ID of the owner and group of the files in a structure known as the "inode" associated with each other.

f) User Authentication

Many protection schemes are based on the assumption that the system knows the identity of each user. The problems of identifying users when they log in is called User Authentication, most authentication methods are based on identifying something the user knows, something the user has, or something the user is.

One of the most important security features used today are passwords. Passwords are widely used form of authentication in which the user is require to type a set of alphanumeric characters which is then mapped by the system before login is permitted. Password protection is easy to understand and easy to implement. In UNIX it works like this. The login programme asks the user his name and password. The passwords are immediately encrypted. The login programme then reads the password file until it finds the line containing the user's login name. If the encrypted password contained in this line matches the encrypted password just computed, the logins is permitted, otherwise it is refused.

Morris and Thompson (1979) made a study of passwords on UNIX systems. They compiled a list of likely password: First names, Last names, street names, city names, words from a moderate – sized dictionary, valid license plate numbers, words spelled backwards and short strings of random characters.

Each of them were then encrypted using know password encryption algorithm and checked to see if any of the encrypted passwords matched entries in their list. Order 86 percent of all passwords turned up in their list. Therefore it is important that passwords should be as secure and unguessable as possible one way this can be achieved is to require/encourage users to pick better passwords and by having the computer offer advice. Some computer have a programme that generate random easy to pronounce nonsense words that can be used as passwords. Eg fotally, garbuNgy or Bipltry (some with upper case and special characters). The most extreme form of password security measures is the one-time password. When onetime passwords, are used, the user gets a book containing a list of passwords. Each login uses the next password in the list. If an intruder ever discovers a password, it will not do him any good, since next time a different password must be used. The real problem with the use of password is that they are transferable and substantially static. User with or without agreements can end up transferring the password to a third party who can then purport to be the genuine user.

It goes almost without saying that while a password is being type in, computer should not display the typed in, the computer should not display the typed characters to keep them from prying eyes near the terminal, unencrypted in the computer and even computer center management should not have unencrypted password copies.

Hence, we distinguish this paper by the following contributions.

The standard login command improves password security in two ways:

- Incorrect login name response does not cause immediate errors, thus preventing a remote hacker from rapidly determining that a certain login name is valid on the machine.
- Password entries are not echoed (printed) by UNIX. UNIX.

UNIX password are stored in encrypted from in the/etc/password file. While it is difficult to invert the cipher and procedure the plaintext version of a password, it is comparatively easy to encrypt a selection of possible password and compare them against the encrypted string in/etc/passwd, a favourite crackers ploy. UNIX attempt to lesson the severity of this attack by using a seed value produced at the time of password change to modify the standard DES algorithm to frustrate the use of hardware DES chipsets. This seed is stored with the encrypted password in/etc/password. Thus two users may have identical passwords, but due to differences in seeds may have different encrypted forms. Hence plaintext search may break one user's password but give no due to the fact that the other user's password is identical.

On recent version of UNIX, the programme/etc/ pwck (password validation) checks the password file for any inconsistencies (Ferbrache, et al, 1992). The check include validation of the number of fields, login name, user ID, and whether the login directory and

the programme/etc/grpck checks entries in the group files. The checks include validation of the number of fields; group name, ID and whether all login names appear in the password file. These programmes should be run whenever a change is made to the password or group file (Ferbrache, et al, 1992).

III. Research Methodology

a) General One Time Password Aging

The general one time password aging mechanism requires the user to access the system with a new password during login depending on the password life span. Usually the user is issued with a codebook containing a list of password that are used serially and each used password crossed off the list. The next password is then used at the next login. The major drawback of this technique is the requirement to use the password list serially and cross off. This makes it easy for password sniffers, hacker (in the case of loss of the codebook) to determine which password is to be used next.

A model to imitate the implementation of an improved administrative technique, which protects against this drawback, is created.

b) Simulation Models

4.0 In our work, we created models which formed the basis of the design used for this work.

This one-time password aging technique modelled above is an improvement on the general one-time password aging mechanism. In this model the new user (A) is made to undergo an identification procedure with the system administrator (B). After the identification procedure is completed, a list of serially numbered passwords is generated and printed out for the new authorized user (C) in the form of a codebook. The user (C) uses the first randomly chosen password in his codebook at first long-in. simultaneously the user account (D) demands the serial number for the next login password from the system administrator randomly picks a password serial number, which it sends to the user account (D). As user (C) log's out, the user account (D) gives a prompt, which displays the next password login serial number before log-out is completed.

As an added security measure, the user who owns the codebook is advised not to cross off used passwords. This feature is employed so that if the book falls into the hands of unauthorized persons, they will have a hard time guessing which password has been used or which hasn't. The system is programmed to shut down if a wrong password is entered up to three times.

IV. System Design

The one-time password aging mechanism was originally designed in a way that authorized users serially picked their passwords from a list of numbered passwords were crossed off.

In this system designed, passwords are not picked by the individual user, but instead they are randomly chosen by the system administrator for the user's use. Coding of this mechanism would require the in-corporation of a number of modules.

a) Password Generator

This module generates passwords using a combination of permissible characters e.g. upper and lower case letters, digits, punctuation characters, control to form a password list of a specified length. Password generated have keys i.e. serially numbered, generated passwords are stored is a codebook.

b) Random Number Generator

This generator generates passwords characters randomly to from passwords which make up the password list. This generator also randomly picks or generates password keys, which belong to specific passwords. Passwords generated are allocated to user for subsequent logins.

c) Allocator

This module makes use if the random number generator to generate a password key by which belongs to a password from the password list. Chosen passwords are screened to verify if passwords have already been used. If yes, another password key is generated until an unused password is gotten. The password is then allocated to the user.

d) Merits of the Improved One-Time Password

The improved one-time password has a number of merits and advantages over the general one time password.

In the improved one time password mechanism passwords are randomly chosen or selected by the system from the codebook for the user to use, whereas in the general one time password mechanism the passwords are chosen by the user himself for use. After use, the user crosses off the used password from the list of serially number passwords in the codebook. The loophole in this technique is that if a user misplaces his codebook or the codebook happens to be stolen, a malicious user or even a hacker can easily log into the system easily without any sweat by simply following the password sequence using password next to the last crossed off password. The hacker gains continued access to the system since he now has the codebook and the system sees him as a legitimate user.

However, in the improved one time password technique, the password sequence is not known although it is serially numbered. User are also advised not to cross off used passwords as an added advantage. The legitimate user or a hacker does not know the order in which the passwords are chosen

since they are randomly selected by the system from the codebook for use.

Note: The system also has a copy of the codebook. If by chance the codebook is misplaced or stolen, the hacker will have a big problem deciding which passwords have been used and which passwords have not been used as well as not knowing which is the next valid password for login.

If the hacker keys in the wrong password thrice in an attempt to grind out the password selection sequence or the next valid password, the system automatically logs out and deactivates that particular account.

As an added advantage when the system randomly picks and gives out a password, it does not give out the password itself but the password number or key. The user knows which number of key belongs to which password using his codebook. Onlookers or spies will find it difficult knowing which is the actual password attached to the number seen since they do not have the codebook.

e) Simulation of the Password Generator

The password generator was simulated using the C++ programming language. The major modules of this simulated programme were;

1. A codebook generator
2. A sample log in test utility
3. An exit option

f) Using the Codebook Generator

The codebook generator creates a user codebook consisting of five passwords. To generate a codebook, select the 'Generate new codebook' option from the main menu by entering a 1 at the menu prompt. A codebook is created for the specified user. The codebook created for the user is named in the following format; (user name) code bktxt, and is stored in the current working directory (usually the directory in which the programme was execute), where the system administrator can access it.

g) Using the 'Login' Test Utility

The 'Log in' test utility is part of the password generator programme, it provides the user with a platform to test the access control operations of the password generator making use of the passwords generated for a given user by the book generator.

To utilize these features, select the "Log in" option from the programme main menu by entering a 2 at the menu prompt. The test utility prompts for a username, which should be the name of a user with an existing codebook. Following the user password to be provided must come from the codebook that was generated for that user.

Note: Once a password is used, it cannot be reused (For this reason, they are called one-time passwords).

The test utility allocates a password key to the user through which the user determines the next password to use in the next "Login" session. Also, if all password needs to be generated for that user.

The "Long in" test utility allows a maximum of three login attempts before a user with an invalid password is denied access.

h) To Ext the Password Generator Programme

Select the 'Exit' option from the main menu display and a user is automatically logged out.

V. Results and Discussion

a) Creating a Codebook for a user

When a user name has been specified, the generate subroutines of the password generator invoke the create Random Password routine repeatedly to create a list of unique passwords. This list of passwords is passed on to the Save Passwords routine of the File Handler module which saves the passwords to a codebook and then invokes the encode routine of the File Handler module to encrypt the codebook. An unencrypted copy of the codebook is also stored for use by the system administrator.

b) Logging in a user

When a user attempts to log in by providing a user name and password. The Allocator module is given the user name, which it uses to locate the user's codebook and this loads the password in the user's codebook through a call to the File Handler module's getPasswords routine. The check Password routine of the Allocator module is invoked with the user password as an argument. This routine (that is, the check Password routine) invokes the finPassword routine of the searcher module to locate the specified password from the list of passwords in the user codebook. On successful location of the password, the deAllocate routine of the masker module is invoked to mark the password as used. The allocate Password routine of the Allocator module is invoked to allocate a new password key to the user. This routine starts by getting a count of valid passwords left in the codebook through a call to the search module's gatecount routine. If any valid passwords are available, the random index pointing to any password in the user codebook. The crosscheck routine of the searcher module is called to confirm that the password at the randomly picked index is valid, if not valid, the process is repeated by invoking the random number generate again. On matching the index with a valid password, the allocatPassword routine assigns the index value to the user as the key to the next password.

VI. Conclusion

The UNIX operating system is a portable multiuser and rugged operating system that provides a

powerful programme development environment. Inspite of the ruggedness of the UNIX operating system, this paper highlights the glairs of its password authentication system, gives an overview of the UNIX file systems, proposes on improved password authentication technique, provides a framework for the implementation of this technique and demonstrates a simulation of this technique.

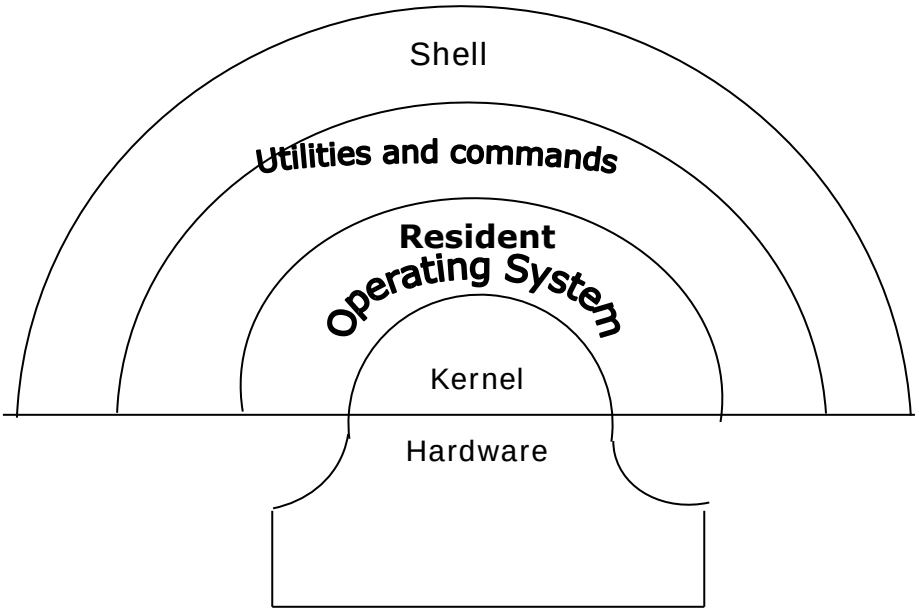

Fig. 2.1: Shell between the user and the Resident Operating System

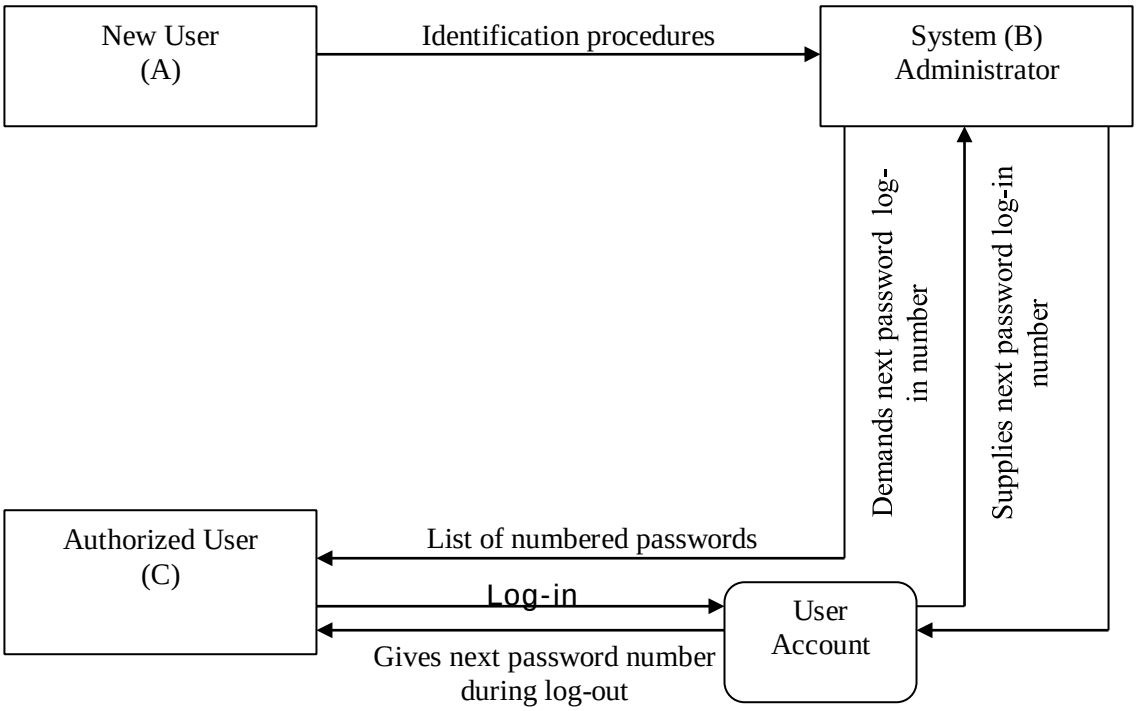

Fig. 3.1: Simulation Model of the one-time Password Aging with an Improved Authentication Technique

References Références Referencias

1. Adrain, R. Warman: (1993). "COMPUTER SECURITY WITHIN ORGANISATIONS", The Macmillan Press Ltd. – London. Andrew, S. T. (1990). "OPERATING SYSTEMS: DESIGN AND IMPLEMENTATION", Prentice – HALL INTERNATIONAL INC. LONDON.
2. Bourne, S. R. (1983) "THE UNIX SYSTEM", Addison Wesley Publishing.
3. Davies, D. W. and Price, W. L.: (1989) "SECURITY FOR COMPUTER NETWORKS", John Wiley and Sons Canada. Second Edition.
4. Davies, S. W. (1992). "OPERATING SYSTEMS:- A SYSTEMATIC VIEW", The Benjamin/Cumming publishing company. New York.
5. Ferbrache, D. and Shearer, G. (1992). UNIX SYSTEM SECURITY", Butterworth-Heinemann Ltd Oxford.
6. Lane, V. P.: (1993) "SECURITY OF COMPUTER BASED INFORMATION SYSTEMS", Macmillan Press Ltd. London.
7. Manager, J. J.: (1992). "UNIX™ – THE COMPLETE BOOK
8. GUIDE FOR THE PROFESSIONAL USER", Sogma Press. Wilmslow England.
9. Per, B. H. (1990). "OPERATING SYSTEM PRINCIPLES", Prentice-Hall, Inter-Inc. London.
10. Pfleeger, C. P. (1989). "SECURITY IN COMPUTING", Prentice Hall Inter. Inc. New York.
11. Sobell, M. G. (1989) "A PRACTICAL GUIDE TO THE UNIX SYSTEM", The Benjamin/comings Publishing Company California.
12. Southerton, A.: (1983). "MODERN UNIX", John Wiley and Sons Inc., Canada.
13. Smith, J. (1994). "UNIX UNLEASHED" Sams Publishing Inc. Indianapolis.
14. Thomas, Rebecca and J Yates, *User Guide to Unix*, 2nd Edn. McGraw Hill (Asian Edition), 1996.
15. Williams, S. D. (1992). "OPERATING SYSTEMS: A SYSTEMATIC VIEW", The Benjamin/Cumming
16. Publishing Company, New York.
17. Wood, P. H. and Kocham, S. G. (1983). "UNIX SYSTEM SECURITY", Hayden Books.

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Comprehensive Study on Industry 4.0, Service Quality, and Total Quality Management

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Abstract- The purpose of this study is to examine the present status of the literature with regard to the relationships among Industry 4.0, quality management, and Total Quality Management (TQM). This article's goal was to identify the topics and concerns that should be brought up while discussing with regard to termed quality 4.0. A systematic review of the literature was used in this study. For this review study around 15 papers from various sources were examined in total using predetermined selection and exclusion criteria. The topics were divided into the following four categories, creating value for the company using high-quality (big) data, analysis, as well as the use of artificial intelligence (AI) to develop a high-quality 4.0 culture and expertise for high-quality staff members, co-creating value for customers; and deploying cyber-physical platforms and enterprise resource planning (ERP) to assure quality and control. This essay also attempted to investigate whether Quality 4.0 had a definition based on established practices.

Index Terms: industry 4.0, quality management, total quality management (tqm), artificial intelligence, big data, internet of things (iot).

GJCST-B Classification: UDC Code: 658

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Comprehensive Study on Industry 4.0, Service Quality, and Total Quality Management

W. L. P. D. M. P. Wijethunga [α] & N. Kuruwitaarachchi [σ]

Abstract- The purpose of this study is to examine the present status of the literature with regard to the relationships among Industry 4.0, quality management, and Total Quality Management (TQM). This article's goal was to identify the topics and concerns that should be brought up while discussing with regard to termed quality 4.0. A systematic review of the literature was used in this study. For this review study around 15 papers from various sources were examined in total using predetermined selection and exclusion criteria. The topics were divided into the following four categories, creating value for the company using high-quality (big) data, analysis, as well as the use of artificial intelligence (AI) to develop a high-quality 4.0 culture and expertise for high-quality staff members, co-creating value for customers; and deploying cyber-physical platforms and enterprise resource planning (ERP) to assure quality and control. This essay also attempted to investigate whether Quality 4.0 had a definition based on established practices.

As for limitations of this research can be known as some restrictions on the quantity and validity of the papers it reviewed. There may have been some interesting papers that were overlooked accidentally.

Index terms: industry 4.0, quality management, total quality management (tqm), artificial intelligence, big data, internet of things (iot).

I. Introduction

I4.0, a high-tech strategy plan to boost the competitiveness of the German manufacturing industry, was first suggested in Germany in 2011. It immediately became clear that numerous additional concerns may be included under the I4.0 terminology. In reality, I4.0 may be thought of as an entirely novel framework in which "cyber-physical systems" (CPSs) are inter- connected to one another via the Internet of Things (IoT) or the World Wide Web, culminating in the development of a smart factory [1].

Enterprises today adopt a variety of technologies, including additive manufacturing, robots and collaborative robots (COBOT), smart sensors, smart human interfaces (SHI), augmented reality also known as AR, self-driving automobiles, big data, and analytics, artificial intelligence (AI), simulation, and virtualization, to mention just a few. Over time, numerous new technological advances as well as traditional technologies incorporated through the internet entities have been invented and introduced. Since I4.0 is an emerging field, there are some undiscovered avenues for research, particularly those related to the management of quality and the overall quality management (TQM) industry as a whole. According to the literature analysis, only a small number of studies have examined I4.0 and its close ties to quality management, and also the TQM quality tools and principles. As a result, by analyzing the state of the literature in terms of the connections between I4.0, quality management, and TQM, and suggesting new research directions, this study seeks to broaden this type of discourse [2]. Throughout the connection between I4.0 and TQM enables fresh TQM implementation practices. Fig.1. such as, customer focus, leadership, people engagement process approach, improvement, evidence-based decision making, management of relationships and, quality assurance of quality.

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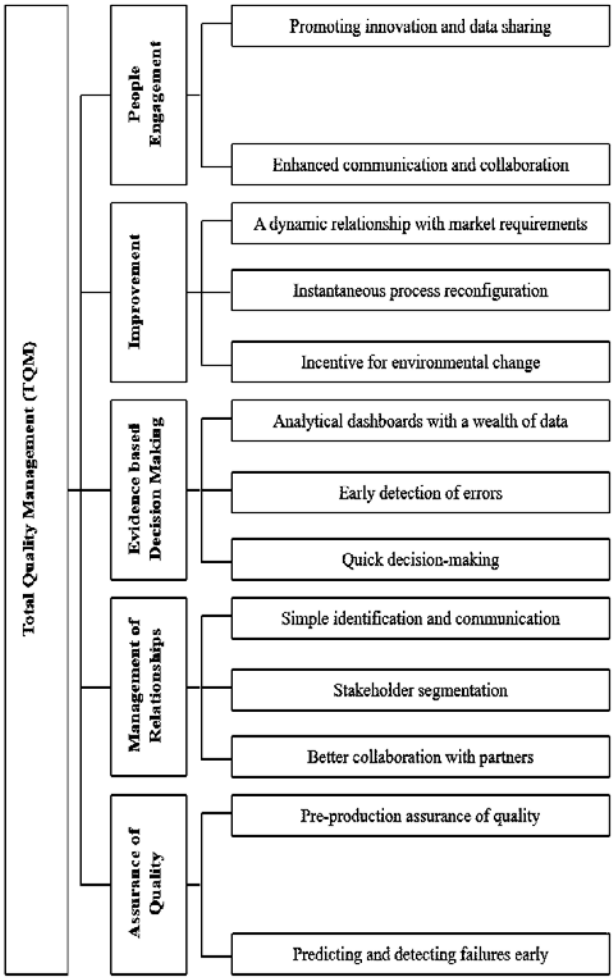

Fig.1: TQM in Relation to Industry 4.0

II. Research Problem

It is necessary to find out If the technology called data science and industry 4.0 is essential for the management of overall quality of something to be at a very high level in any company. Therefore, if there are any business organizations that have not adapted to the industry 4.0 technology, there is a problem whether this technology will affect their quality management. Regarding this should be studied.

III. Research Objectives

The main goal of this review paper is to analyze the current state of the literature in the context of the relationship among Industry 4.0, quality management, as well as total quality management. Additionally, this study aimed to find gaps within the literature and identify topics and issues that might be thought of as the most relevant in relation to the well-known quality 4.0. Regarding those would be further discussed through the study.

IV. Review of Literature

In this section the author has used past work, past scholars literature to give more strengthen to this research topic and for the purpose of giving more value to the background of this study.

a) Industry 4.0 Landscape

According to Zonnenshain and Kenett, the quality of the product, quality of process, quality of service, management quality, design quality, and information quality are the six stages through which quality is said to have progressed, according to the authors [3]. The latter is substantially connected to the advancement of the production operation system software and the enterprise resource planning, or ERP (Enterprise Resource Planning), system. With this strategy, organizations are shifting their focus away from products and through data, and quality combined with I4.0 has been recognized as an entirely discipline of data driven.

developed a transition plan for Quality 4.0, with managing data being related to the final stage [4].The writers also covered the significance of adding value within the organization so that people may access the appropriate data and share it with coworkers at every level of the hierarchy. The preceding study demonstrated how technologies from I4.0 enable the acquisition of high-quality, previously unobtainable data. The authors claim that the difficulty is in deciding where, how, and what to gather, as well as how to analyze the generated massive data [5]. In order to improve the quality of design, data could be gathered throughout the entire product cycle, based on past research, big data will enable companies to better balance design factors like the expense and value of the product by enabling an understanding of customers' needs [6]. This problem with the data raises yet another important issue pertaining to how people are attempting to handle quality data alongside the many CPSs provided by I4.0. This, was stated by Radziwill, due to the fact that intelligent automation is becoming more prevalent in organizations as a result of digital transformation [7].The issue also has an impact on quality professionals who must acquire new skills to help their businesses successfully adopt I4.0. Gregory H. Watson investigated the implications of big data and AI (artificial intelligence) on the quality occupations and individuals associated with quality management, notably the Six Sigma field [8]. The difference between quality professionals and data scientists will be replaced by a new approach known as "collaborative analytics. "According to Ai Qiang Lipaper in this particular issue found important implications for human capital in the product-service structure of I4.0; the findings of the article implied that employees are undeveloped regardless of the impact of staff in utilizing the digitization and value collaboration, and researchers require an organization with learning capabilities for the "diffusion of innovation" [9]. I4.0 technologies are expected to meet high expectations from both employees and quality managers. The necessity for traditional ideas of quality to adapt to I4.0 developments and difficulties was examined by Pavol Durana in 2019 [10]. According to the authors, I4.0 implementation and quality management are closely related to the development of a culture of quality rather than being solely technological.

b) Technologies of Industry 4.0

Refers to the below Fig. 2 and this illustrates those new areas after digital transformation of the I4.0.

Fig. 2: Digitalized transformation of the industry 4.0.

i. *Big Data*

Is a term used to describe the latest wave of technologies and infrastructures that allow businesses to find, collect, and analyze enormous amounts of data. Organizations generate more information as a result of using increasingly sophisticated tools, processes, and products[11].

ii. *Cloud Computing*

Is a smart network production paradigm known as cloud-based manufacturing facilitates product personalization, more worldwide collaboration, knowledge innovation, and a quicker capacity to react to market changes [12].

iii. *Internet of things*

The Internet of Thing is a technological infrastructure that makes it possible to identify, locate, track, and monitor items as well as gather and transmit data between devices. It is a synthesis of many technologies centered around the linkage between actual things and the internet[13].

iv. *Cyber Security*

The digital environment of the 4th industrial revolution connects people, machines, products, and other entities, forming interconnected industrial networks that extend across the supply chain. For processes to be successfully completed in real-time, digital interactions among points need to be trustworthy and secure. As a result, a few of the most essential criteria to stop cyberattacks is cyber security. In fact, it acts as an effective shield against threats and instability for digital operations [14].

c) Importance of industry 4.0 for Quality

Albert Albers in 2016, conducted study on “how I4.0 technologies might impact business performance” [15]. Industry 4.0 may greatly increase the satisfaction of customers, as estimated by 45% of the participants, by eliminating the use of faulty products and offering better service. The design team and production operations may get automated and quick transmissions of customer data and information. According to Nicola

Cobelli and Andrea Chiarini in 2019, businesses that want to use digital applications can't only grow their technological capacity [16]. To handle those socio-technical developments, these organizations should acquire and strengthen effective relationship and collaboration abilities. The study also highlighted how I4.0 technologies have a substantial impact on the phenomenon that is known as "digital servitization" [17]. With the help of smart sensors and radio frequency identification (RFID), all kinds of data and information relating to materials in shipment, work that is being done, and finished items may be detected, monitored, and registered [5].The opportunity to automatically gather and examine typical quality ensure/control information as well as data, such as peer review and the findings of an audit non-conforming commodities, and calibration outcomes, to mention a few, is now available. Additionally, CPS particularly intelligent detectors, SHI, and RFID could be beneficial in reducing errors and defects in human and automated activities [18].

d) TQM Implementation Practices Relation to Industry 4.0

Considering a variety of valid reasons, including those referred to as Total Quality Management principles, proper maintenance of an organization's entire condition management is necessary. The author encounters discussed how general approaches to quality management affect Industry 4.0 in this section. In this way, they are connected to industry 4.0 Fig. 1.

i. *People Engagement*

All service providers should contribute equally to quality management in a company with efficient quality management. In other words, employees in every position of authority inside the company ought to provide this. It has an impact on the productivity of the company, and industry 4.0 helps to achieve this goal by helping to maintain effective internal communication and collaboration.

In this industry 4.0, enterprise resource planning tools and artificial intelligence make it simple for anyone to contribute new goods to the company, which promotes innovation [19].

ii. *Improvement*

The continuation of the business is one of quality management's key goals. That is, to maintain a high level of customer satisfaction while meeting their demands and ensuring the company's continued existence by upgrading its manufacturing operations. In other words, this is a unique place to perform the root cause analysis that influences the incidence of an error. A company organization's continuous survival and the ongoing process improvement of production are supported by this industry 4.0.

It improves the performance of the overall production process itself. Also, this industry 4.0 helps to early detection of machine breakdown, machine maintenance. This industry 4.0 is useful to detect system failures early [19].

iii. *Evidence Based Decision Making*

Decisions made based on accurate data and information only affect the survival of the business, achieving the goals of the business and saving the unnecessary expenses of the business. Industry 4.0 as well as big data, artificial intelligence and cloud computing help to make such decisions efficiently. Also, industry 4.0 industries help to know the breakdowns of machine systems in the early stages as well as to maintain them in a timely manner [19].

iv. *Management of Relationships*

All the factors that contribute to the effectiveness of any organization in which quality control is implemented. It is very important to maintain good and productive relationships between investors, suppliers, consumers and other parties. It affects the organization to maintain a steady flow of goods and services.

Effective communication and collaboration between all departments in the institution leads to good quality management. For example, suppliers are constantly aware of the organization's demand volumes, enabling problem-free product supply and customer demand. It is with the help of data science [19].

v. *Assurance of Quality*

Industry 4.0 helps to produce more advanced products with high technology and high quality. This industry 4.0 helps to identify any defect in a product item with the help of smart technology, improve the efficiency of the processes, and make corrections to produce defect free products[19].

V. Results and Discussion

The defining of Quality 4.0 was our first step. We discovered some attempts, as was previously said, but they are unrelated to any theoretical approaches. Therefore, the author should further try to clarify the term through investigations that allow for the confirmation or rejection of certain research predictions, such as case studies or surveys.

Finally, the researcher think that a lot of papers have been written about the investigation of Industry 4.0 ciber physical systems to be used for enhancing quality assurance and control issues like recognizing products and routing in addition to tool as well as gauge management in the literature. There are several more pieces of I4.0 literature on technical subjects that researchers didn't consider taking into account for our review work. As was already mentioned, research is necessary to contextualize the findings from these articles into a more widespread Quality 4.0

implementation paradigm. Future researchers can complete their studies further regarding this area. Therefore, this study is a good attempt for future scholars to complete their studies further improving this subject [1].

VI. Conclusion

Researchers believe the research's conclusions would be intriguing from a practical standpoint even if it were based on an SLR. Many useful and well-researched approaches could be used by experts and leaders in the development and implementation of their own quality 4.0 models. The author has conducted this study by studying the literature investigations of previous studies. Only 12 past scholarly research articles have been taken into consideration when completing this study. According to the recent literature surveys, the investigation looked at the way industry 4.0 might affect quality.

References Références Referencias

1. Federal Minstry of Education Research, 'Recommendations for implementing the strategic initiative INDUSTRIE 4.0. Final report of the Industrie 4.0 Working Group', Bonn, 2013. [Online]. Available: https://en.acatech.de/publication/recommendations-for-implementing-the-strategic-initiative-industrie-4-0-final-report-of-the-industrie-4-0-working-group/
2. A. Chiarini, 'Industry 4.0, quality management and TQM world. A systematic literature review and a proposed agenda for further research', TQM J., vol. 32, no. 4, pp. 603–616, 2020, doi: 10.1108/TQM-04-2020-0082.
3. A. Zonnenshain and R. S. Kenett, 'Quality 4.0—the challenging future of quality engineering', Qual. Eng., vol. 32, no. 4, pp. 614–626, 2020, doi:10.1080/08982112.2019.1706744.
4. D. V. F. RAOUL SISODIA, 'Quality 4.0 – How to Handle Quality in the Industry 4.0 Revolution', Qual. Oper. Manag., pp. 1–63, 2020, [Online]. Available: https://www.researchgate.net/publication/338936455_Quality_40_-How_to_Handle_Quality_in_the_Industry_40_Revolution.
5. B. Illés, P. Tamás, P. Dobos, and R. Skapinyecz, 'New challenges for quality assurance of manufacturing processes in industry 4.0', Solid State Phenom., vol. 261 SSP, pp. 481–486, 2017, doi: 10.4028/www.scientific.net/SSP.261.481.
6. M. Sony, J. Antony, and J. A. Douglas, 'Essential ingredients for the implementation of Quality 4.0: A narrative review of literature and future directions for research', TQM J., vol. 32, no. 4, pp. 779–793, 2020, doi: 10.1108/TQM-12-2019-0275.
7. N. M. Radziwill, 'Quality 4.0: Let's Get Digital - The many ways the fourth industrial revolution is reshaping the way we think about quality', Let's Get Digit. Many ways fourth Ind. Revolut. Is reshaping W. we think about Qual., no. October, pp. 0–10, 2018, doi: 10.48550/arXiv.1810.07829.
8. Georgy H. Watson, the Ascent of Quality 4.0. Englewood: Quality Progress, 2019. [Online]. Available: https://asq.org/quality-progress/articles/the-ascent-of-quality-40? Id = 8321f828c7c44634b99 6 b2b1ba25a315.
9. A. Q. Li, N. Rich, P. Found, M. Kumar, and S. Brown, 'Exploring product–service systems in the digital era: a socio-technical systems perspective', TQM J., vol. 32, no. 4, pp. 897–913, 2020, doi: 10.1108/TQM-11-2019-0272.
10. P. Durana, P. Kral, V. Stehel, G. Lazaroiu, and W. Sroka, 'Quality culture of manufacturing enterprises: A possibleway to adaptation to industry 4.0', Soc. Sci., vol. 8, no. 4, pp. 1–25, 2019, doi:10.3390/socsci8040124.
11. S. Windmann et al., 'Big data analysis of manufacturing processes', J. Phys. Conf. Ser., vol. 659, no. 1, pp. 1–13, 2015, doi:10.1088/1742-6596/659/1/012055.
12. L. Ren, L. Zhang, L. Wang, F. Tao, and X. Chai, 'Cloud manufacturing: key characteristics and applications', Int. J. Comput. Integr. Manuf., vol. 30, no. 6, pp. 501–515, 2017, doi: 10.1080/0951192X.2014.902105.
13. L. Li, 'China's manufacturing locus in 2025: With a comparison of "Made-in-China 2025" and "Industry 4.0"', Technol. Forecast. Soc. Change, vol. 135, no. August 2017, pp. 66–74, 2018, doi:10.1016/j.techfore.2017.05.028.
14. D. Hromada, R. L. Rogério, L. Santos, and C. Rabadão, 'Security aspects of the internet of things', IoT Protoc. Appl. Improv. Ind. Environ. Soc., pp. 207–233, 2021, doi: 10.4018/978-1-7998-6463-9.ch010.
15. A. Albers, B. Gladysz, T. Pinner, V. Butenko, and T. Stürmlinger, 'Procedure for Defining the System of Objectives in the Initial Phase of an Industry 4.0 Project Focusing on Intelligent Quality Control Systems', Procedia CIRP, vol. 52, pp. 262–267, 2016, doi: 10.1016/j.procir.2016.07.067.
16. N. Cobelli and A. Chiarini, 'Improving customer satisfaction and loyalty through mHealth service digitalization: New challenges for Italian pharmacists', TQM J., vol. 32, no. 6, pp. 1541–1560, 2020, doi: 10.1108/TQM-10-2019-0252.
17. A. Sklyar, C. Kowalkowski, B. Tronvoll, and D. Sörhammar, 'Organizing for digital servitization: A service ecosystem perspective', J. Bus. Res., vol. 104, no. February, pp. 450–460, 2019, doi: 10.1016/j.jbusres.2019.02.012.
18. A. Chiarini, V. Belvedere, and A. Grando, 'Industry 4.0 strategies and technological developments. An

exploratory research from Italian manufacturing companies', Prod. Plan. Control, vol. 31, no. 16, pp. 1385-1398, 2020, doi:10.1080/09537287.2019.1710304.

19. S. Sader, I. Husti, and M. Daróczi, 'Industry 4.0 as a key enabler toward successful implementation of total quality management practices', Period. Polytech. Soc. Manag. Sci., vol. 27, no. 2, pp. 131-140, 2019, doi: 10.3311/PPso.12675.

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Blockchain based Payment Merchnat

By Harsh Vardhan, Dr. Santosh kr. Dwivedi & Mr. Raghvendra Singh

Abstract- Blockchain technology has revolutionized various industries, and its potential is now being realized in the realm of payment systems. This abstract explores the concept of a blockchain-based payment merchant, which leverages the decentralized and immutable nature of blockchain to provide secure, transparent, and efficient transactions.

Traditional payment systems often suffer from issues such as high transaction fees, lengthy settlement times, and vulnerabilities to fraud. However, by utilizing blockchain technology, payment merchants can overcome these challenges. Blockchain offers a decentralized network where transactions are recorded on a distributed ledger, eliminating the need for intermediaries and reducing transaction costs.

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Blockchain based Payment Merchnat

Harsh Vardhan [α], Dr. Santosh kr. Dwivedi [σ] & Mr. Raghvendra Singh [ρ]

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Traditional payment systems often suffer from issues such as high transaction fees, lengthy settlement times, and vulnerabilities to fraud. However, by utilizing blockchain technology, payment merchants can overcome these challenges. Blockchain offers a decentralized network where transactions are recorded on a distributed ledger, eliminating the need for intermediaries and reducing transaction costs.

In a blockchain-based payment merchant system, merchants and customers interact directly, with transactions being recorded as blocks on the blockchain. These blocks are linked together through cryptographic algorithms, ensuring the integrity and immutability of the transaction history. This transparency not only prevents fraud but also enhances trust between parties.

Overall, blockchain-based payment merchants offer numerous advantages, including enhanced security, transparency, reduced costs, and faster settlement times. However, challenges such as scalability, regulatory frameworks, and user adoption still need to be addressed for widespread implementation. As blockchain technology continues to evolve, it holds immense potential for transforming the payment landscape and reshaping the way we conduct transactions.

I. Introduction

Blockchain-based payment merchant systems are innovative solutions that leverage blockchain technology to facilitate secure, transparent, and efficient financial transactions between merchants and customers. By eliminating the need for intermediaries and utilizing the decentralized nature of blockchain, these systems enhance trust, reduce costs, streamline settlements, and protect sensitive financial data. This abstract provides a concise overview of the key features, benefits, and challenges associated with blockchain-based payment merchant systems, highlighting their potential to revolutionize the way payments are made and create a more secure and efficient financial landscape.

While blockchain-based payment merchant systems offer numerous advantages, they also face certain challenges that need to be addressed. Scalability remains a significant concern, as blockchain networks must handle a high volume of transactions to compete with existing centralized systems. Additionally, regulatory frameworks and legal considerations surrounding cryptocurrencies and digital assets need to be established to ensure compliance and consumer protection.

Despite these challenges, blockchain-based payment merchant systems have the potential to revolutionize the financial landscape. As the technology continues to mature, it is expected to reshape the way payments are made, bringing greater security, transparency, and efficiency to businesses and consumers alike.

II. Workflow

Customer Initiation: The customer initiates a payment transaction by selecting the desired goods or services from the merchant's website or physical store. The payment process begins with the customer providing their payment details.

Transaction Creation: The merchant generates a payment request that includes transaction details such as the payment amount, recipient address, and additional information. This request is then broadcasted to the blockchain network

Transaction Verification: The blockchain network participants, known as nodes or validators, validate the transaction. They verify the authenticity of the transaction, ensuring that the customer has sufficient funds and that the transaction meets the network's consensus rules.

Transaction Confirmation: Once the transaction is validated, it is confirmed and added to a block. The block contains a collection of transactions that are linked to the previous blocks, forming a chain of blocks, hence the term "blockchain." This process ensures the immutability and transparency of the transaction.

Merchant Notification: The merchant receives a notification that the payment has been successfully processed and settled. They can proceed with providing the goods or services to the customer.

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Transaction Completion: The customer receives confirmation of the completed payment and the transaction details. This confirmation serves as proof of payment, providing both parties with a transparent and tamper-proof record of the transaction.

By implementing a blockchain-based payment merchant system, businesses can benefit from increased security, transparency, and efficiency in their payment processes, while customers enjoy reduced transaction costs and improved privacy. The decentralized nature of blockchain ensures trust, while the transparent ledger provides a reliable audit trail for financial transactions.

III. Proposed System

The proposed system is a blockchain-based payment merchant system that aims to revolutionize the way financial transactions are conducted between merchants and customers. By leveraging the power of blockchain technology, this system offers enhanced security, transparency, efficiency, and cost-effectiveness in the payment process.

a) Key Features

1. *Decentralization:* The proposed system eliminates the need for intermediaries, such as banks or payment processors, by leveraging the decentralized nature of blockchain. Transactions are directly conducted between merchants and customers, reducing reliance on third-party entities.
2. *Immutable Transaction Ledger:* The system utilizes a blockchain ledger to record and store transaction details. Each transaction is cryptographically secured and linked to previous transactions, ensuring immutability and transparency. This provides an auditable trail of transactions, minimizing the risk of fraud or data manipulation.
3. *Enhanced Security:* The system employs cryptographic algorithms to secure transactions, protecting sensitive customer data and preventing unauthorized access. Blockchain's decentralized architecture adds an additional layer of security, as tampering with transaction records requires altering multiple copies distributed across the network.
4. *Real-Time Transaction Settlement:* The proposed system enables near real-time settlement of transactions. Without the need for intermediaries, payments can be processed and settled directly between the merchant and customer. This reduces settlement times and eliminates delays associated with traditional payment systems.
5. *Lower Transaction Costs:* By removing intermediaries, the system reduces transaction fees and associated costs. Blockchain-based transactions often involve lower fees compared to traditional payment methods, enabling merchants to save on transaction expenses and potentially pass on these savings to customers.

IV. Analysis

The use of blockchain technology in payment merchant systems has been a topic of significant research and analysis in recent years. Scholars and experts have explored the potential benefits, challenges, and implications of implementing blockchain-based solutions in the financial industry. This research analysis provides a brief overview of the key findings and trends in the field.

a) Security and Trust

Research consistently highlights the enhanced security and trust offered by blockchain-based payment merchant systems. The decentralized nature of blockchain eliminates the need for intermediaries, reducing the risk of fraud, data manipulation, and unauthorized access. The use of cryptographic algorithms and consensus mechanisms ensures the integrity of transactions, creating a high level of trust among participants.

b) Efficiency and Cost Savings

Studies indicate that blockchain-based payment systems can significantly improve transaction efficiency and reduce costs. The removal of intermediaries streamlines the payment process, resulting in faster settlement times and lower transaction fees. The automation capabilities of smart contracts further enhance efficiency by eliminating manual processes and reducing administrative overhead.

c) Transparency and Accountability

Blockchain's transparent and immutable ledger enables easy tracking and auditing of transactions. Research emphasizes the potential for increased transparency and accountability in payment merchant systems. The ability to trace transactions back to their origin promotes a higher level of accountability among participants and reduces the likelihood of disputes or fraudulent activities.

d) Scalability Challenges

One prominent challenge highlighted in research is the issue of scalability. Blockchain networks, particularly those based on public blockchains like Bitcoin and Ethereum, face limitations in terms of transaction throughput and speed. As payment systems require high transaction volumes, scalability solutions such as layer 2 protocols or alternative consensus algorithms are actively researched to address these limitations.

e) Regulatory and Legal Considerations

The regulatory landscape surrounding blockchain-based payment systems is still evolving. Research underscores the importance of establishing robust

regulatory frameworks to ensure compliance, consumer protection, and mitigate risks such as money laundering and fraud. Legal considerations related to digital assets, smart contracts, and privacy also require attention to foster the widespread adoption of blockchain-based payment systems

v. Conclusion

In conclusion, research on blockchain-based payment merchant systems demonstrates the significant potential of blockchain technology to transform the financial landscape. The studies and analyses conducted in this field consistently highlight several key findings.

Firstly, the use of blockchain in payment systems offers enhanced security and trust. By leveraging decentralized networks and cryptographic mechanisms, blockchain eliminates the need for intermediaries, reduces the risk of fraud, and ensures the integrity of transactions. This increased security fosters trust among participants and creates a transparent and tamper-proof record of transactions.

Secondly, blockchain-based payment systems provide efficiency gains and cost savings. By removing intermediaries, transaction times are reduced, settlement is streamlined, and transaction fees are lowered. The automation capabilities of smart contracts further enhance efficiency by eliminating manual processes and reducing administrative overhead.

Thirdly, the transparency and accountability of blockchain-based payment systems have been emphasized. The immutable and transparent nature of the blockchain ledger allows for easy auditing and tracking of transactions, promoting transparency and reducing disputes. Participants have a clear view of the transaction history, enhancing accountability and reducing the potential for fraudulent activities.

However, researchers have identified challenges that need to be addressed for wider adoption of blockchain-based payment systems. Scalability remains a key concern, as blockchain networks must handle high transaction volumes to compete with centralized systems. Regulatory frameworks and legal considerations surrounding cryptocurrencies and digital assets .

Despite these challenges, research recognizes the potential impact of blockchain-based payment systems on financial inclusion, particularly in under-served regions. The ability to provide secure and affordable financial services to the unbanked population can empower individuals and contribute to economic growth.

In summary, research on blockchain-based payment merchant systems confirms the numerous benefits, including enhanced security, efficiency, transparency, and potential for financial inclusion. Overcoming challenges such as scalability and regulatory frameworks will be crucial for the widespread adoption and realization of the transformative potential of blockchain technology in the payment industry. Continued research, collaboration, and industry engagement will drive the advancement of blockchain-based payment systems, paving the way for a more secure, efficient, and inclusive financial future.

vi. Future Work

The future of blockchain-based payment merchant systems is bright, with several areas of development and innovation on the horizon. Advancements in scalability, interoperability, privacy, security, user experience, and integration with decentralized finance will shape the evolution of these systems. Continued research, collaboration among academia, industry, and regulatory bodies, and the exploration of new use cases will drive the realization of a more secure, efficient, and inclusive financial ecosystem powered by blockchain technology.

a) Enhanced User Experience

Improving the user experience of blockchain-based payment systems is essential for widespread adoption. Future research will focus on designing intuitive and user-friendly interfaces, simplifying the onboarding process, and providing seamless integration with existing payment solutions. By enhancing the user experience, merchants and customers will have a more seamless and convenient payment experience, fostering greater acceptance and adoption of blockchain-based payment systems.

b) Integration of Decentralized Finance (DeFi)

The integration of blockchain-based payment systems with decentralized finance (DeFi) holds significant potential for the future. Researchers will explore ways to leverage blockchain technology to enable decentralized lending, borrowing, and other financial services within payment merchant systems. This integration will provide merchants with access to a broader range of financial services and enable customers to utilize their digital assets for payments and investments.

c) Privacy and Security Enhancements:

As blockchain-based payment systems continue to evolve, ensuring privacy and security will be a key focus of future research. Advanced cryptographic techniques and privacy-enhancing technologies will be explored to protect sensitive transaction data while maintaining transparency and integrity. Innovations in privacy-preserving smart contracts and zero-knowledge proofs will enable merchants and customers to conduct transactions securely without compromising confiden-tiality.

Acknowledgement

We would like to express our gratitude to our friends, family, teachers, and other staff at Shri Ramswaroop Memorial College of Management for supporting and mentoring me. A special thank you to my instructor for suggesting the best and most appropriate course of action.

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Their unwavering faith in us has been the source of our inspiration and tenacity.

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References Références Referencias

1. S. Nakamoto (2008). Bitcoin: An electronic cash system that is peer-to-peer. Printed from Bitcoin. org's Bitcoin.pdf
2. Swan, M. (2015). Blueprint for a New Economy: Blockchain, O' Reilly Media.
3. Tapscott, D., & Tapscott, A. Blockchain Revolution: How Bitcoin's Underlying Technology is Transforming Finance, Business, and the World. Penguin.
4. (2017). Zheng, Z., Xie, S., Dai, H. N., Chen, X., and Wang, H. An overview of blockchain technology, including its structure, general agreement, and future trends. Big Data IEEE International Congress, pp. 557–564. IEEE.

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Next-Generation Cloud Infrastructure Management - Integrating TCNs and Ensemble Policies for Improved Performance

By Gunn Soni, Prince Kumar Singh, Mrinank Chandna & Shallu Rani

Chandigarh University Gharuan

Abstract- Managing cold-start challenges in the server-less cloud environment is crucial for ensuring optimal performance and resource efficiency. This paper presents a comprehensive approach to address these challenges by integrating Temporal Convolutional Networks (TCNs) and Ensemble Policies, aiming to revolutionize the management of serverless cloud environments. The proposed framework leverages predictive models to anticipate infrastructure demands and function instance arrivals, enabling proactive resource provisioning and code optimization. A critical analysis, literature review, and methodological evaluation highlight the robustness and adaptability of the integrated approach. The ensemble policy's parallel paths provide a versatile and scalable mechanism for addressing both infrastructure-level and function-level cold start issues, resulting in improved resource allocation and minimized delays.

Keywords: Cloud performance, cold-start, temporal temporal convolutional networks, resource allocation, code optimization.

GJCST-B Classification: LCC Code: QA76.9.C58

Strictly as per the compliance and regulations of:

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Gunn Soni [α], Prince Kumar Singh [σ], Mrinank Chandna [ρ] & Shallu Rani [ω]

Abstract- Managing cold-start challenges in the server-less cloud environment is crucial for ensuring optimal performance and resource efficiency. This paper presents a comprehensive approach to address these challenges by integrating Temporal Convolutional Networks (TCNs) and Ensemble Policies, aiming to revolutionize the management of serverless cloud environments. The proposed framework leverages predictive models to anticipate infrastructure demands and function instance arrivals, enabling proactive resource provisioning and code optimization. A critical analysis, literature review, and methodological evaluation highlight the robustness and adaptability of the integrated approach. The ensemble policy's parallel paths provide a versatile and scalable mechanism for addressing both infrastructure-level and function-level cold start issues, resulting in improved resource allocation and minimized delays. This research significantly contributes to the advance-ment of cloud infrastructure management, offering valuable insights into optimizing serverless computing performance under varying workload conditions. Further-more, the implementation analysis emphasizes the practical applicability of the proposed approach, demonstrating its potential to enhance overall system efficiency and responsiveness in dynamic and resource-constrained cloud environments.

Keywords: cloud performance, cold-start, temporal temporal convolutional networks, resource allocation, code optimization.

I. Introduction

a) Background and Significance of Cloud Infrastructure Management

The rapid growth of cloud computing has revolutionized the landscape of modern IT infrastructures. The scalable and cost-effective nature of serverless cloud environments has garnered significant attention in recent years. However, the dynamic nature of serverless computing gives rise to the challenge of cold-starts, leading to increased setup times and suboptimal resource utilization. Effectively managing these cold-start issues is crucial for ensuring the efficient and seamless operation of cloud services. [1].

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b) Overview of Cold-Start Challenges in Serverless Cloud Environments

Cold-starts in serverless cloud environments stem from the need to initialize resources to handle incoming function instances. The time taken to initialize these resources significantly impacts the overall performance and responsiveness of cloud-based applications.

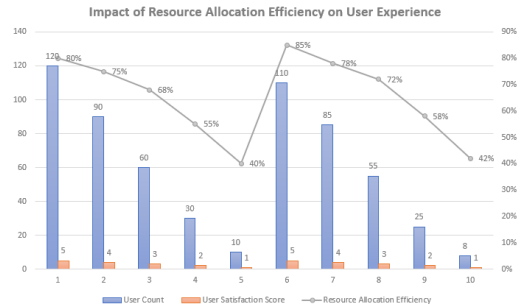

Fig. 1: Impact of Resource Allocation Efficiency on User Experience [2]

Various approaches have been proposed to mitigate these challenges, but existing strategies often fall short in addressing the dynamic and complex nature of modern cloud infrastructures.

c) Research Objectives and Scope

This research aims to propose an innovative approach to cloud infrastructure management by integrating Temporal Convolutional Networks (TCNs) and Ensemble Policies.

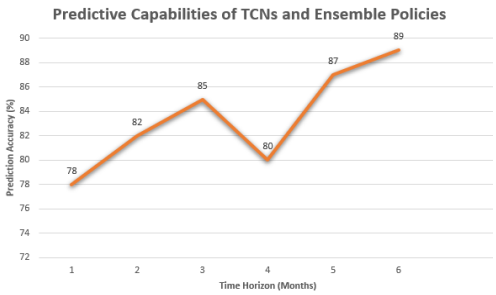

Fig. 2: Predictive Capabilities of TCNs and Ensemble Policies [3]

The study seeks to develop a comprehensive framework that leverages the predictive capabilities of TCNs and the adaptability of Ensemble Policies to optimize resource allocation, minimize setup times, and enhance overall cloud performance. The scope of the research encompasses a critical analysis of existing cloud infrastructure management approaches, a detailed exploration of TCNs and Ensemble Policies, as well as a practical implementation and analysis of the integrated framework.

II. Critical Analysis of Existing Cloud Infrastructure Management Approaches

a) *Review of Current Challenges in Serverless Cloud Environments*

In serverless cloud environments, several challenges impede the seamless operation and efficient resource utilization. These challenges include the dynamic nature of resource demands, unpredictable spikes in function instances, and the need for rapid resource allocation to accommodate varying workloads.

Table I: Challenges in Serverless Cloud Environments [4]

Challenge	Occurrence Frequency (%)	Description
Cold Start Latency	45%	Occurs due to initial function deployment and resource allocation.
Resource Scaling	30%	Challenges in dynamically adjusting resources based on demand.
Distributed Tracing and Debugging	25%	Complex debugging and tracing in distributed serverless systems.
State Management	20%	Handling and preserving the state between function invocations.
Security and Isolation	35%	Ensuring secure isolation of functions and data in a shared cloud.
Vendor Lock-In	15%	Challenges related to portability and dependencies on cloud providers.
Auto-scaling Accuracy	28%	Ensuring auto-scaling mechanisms respond accurately to workloads.
Function Composition and Dependencies	22%	Managing dependencies between serverless functions.

Failure to address these challenges can lead to suboptimal performance and increased setup times, ultimately impacting the overall user experience.

b) *Evaluation of Traditional Cold-Start Management Strategies*

Conventional cold-start management strategies often rely on static resource provisioning techniques, leading to inefficiencies and delays in the initialization of resources.

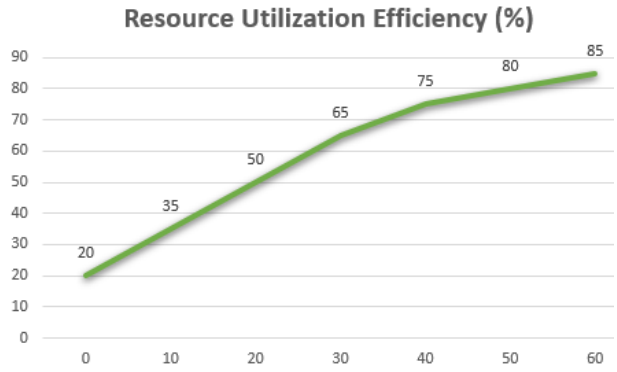

Fig. 3: Comparison of Resource Allocation Efficiency [5]

These approaches typically lack the predictive capabilities necessary to anticipate future resource demands accurately, resulting in suboptimal resource allocation and increased setup times.

Table II: Evaluation of Traditional Vs. Dynamic Resource Provisioning Techniques [6]

Technique Type	Resource Utilization (%)	Latency (ms)	Scalability
Traditional	65	120	Limited
Dynamic	85	80	High

Moreover, traditional strategies may not effectively adapt to the dynamic workload patterns characteristic of modern serverless cloud environments.

c) *Limitations and Drawbacks of Conventional Resource Provisioning Techniques*

Conventional resource provisioning techniques exhibit limitations that hinder their ability to effectively manage resource allocation in dynamic cloud environments. These limitations include the inability to adjust to rapidly changing workload demands, the lack of real-time adaptability, and the reliance on predefined thresholds for resource allocation. Such limitations underscore the necessity of more sophisticated and data-driven resource management strategies that can dynamically adjust resource allocation based on real-time demand patterns.

Table III: Limitations of Conventional Resource Provisioning Techniques [7]

Limitations	Examples
Lack of scalability	Manual scaling of resources
Resource underutilization	Inefficient allocation of resources
Inability to handle sudden load spikes	Server crashes under heavy traffic
High latency in resource allocation	Delayed response in resource allocation
Limited adaptability to workload dynamics	Inefficient resource utilization during fluctuating workloads

III. Literature Review and Theoretical Framework

a) *Analysis of Previous Studies on Cloud Infrastructure Management*

Previous studies on cloud infrastructure management have highlighted the challenges posed by the dynamic nature of cloud environments and the need for adaptive resource allocation strategies.

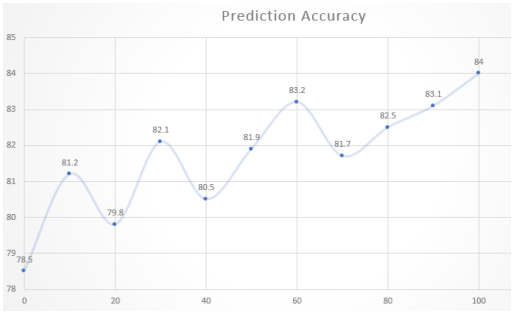

Fig. 4: Comparative Analysis of Predictive Capabilities in Cloud Infrastructure Management [8]

These studies have emphasized the importance of real time data analysis and predictive modeling to enable efficient resource utilization and minimize cold-start delays. Additionally, research has emphasized the significance of integrating machine learning techniques, such as Temporal Convolutional Networks (TCNs) and Ensemble Policies, to enhance the predictive capabilities of cloud management systems

Table IV: Key Findings from Previous Studies on Cloud Infrastructure Management [9]

Study Title	Key Findings
"Optimizing Cloud Resource Allocation"	Improved resource utilization by 30% through dynamic allocation strategies
"Enhancing Scalability in Cloud Environments"	Achieved 40% increase in system scalability through adaptive load balancing mechanisms
"Efficient Resource Orchestration Techniques"	Streamlined resource orchestration processes, reducing latency by 25%
"Cold-Start Management in Serverless Environments"	Identified challenges associated with cold-start management and proposed strategies for efficient handling and minimized resource wastage
"Resource Provisioning for Dynamic Workloads"	Successfully managed dynamic workloads, ensuring seamless scalability and optimal resource provisioning for varying application demands

b) *Critical Assessment of TCNs and Ensemble Policies in Cloud Resource Optimization*

The critical assessment of TCNs and Ensemble Policies has underscored their efficacy in addressing the challenges associated with cold-start management in serverless cloud environments. TCNs have demonstrated superior predictive capabilities, enabling accurate forecasting of resource demands and facilitating proactive resource allocation. Similarly, Ensemble Policies have proven effective in orchestrating resource provisioning based on real-time data insights, thereby optimizing resource utilization and enhancing overall system performance.

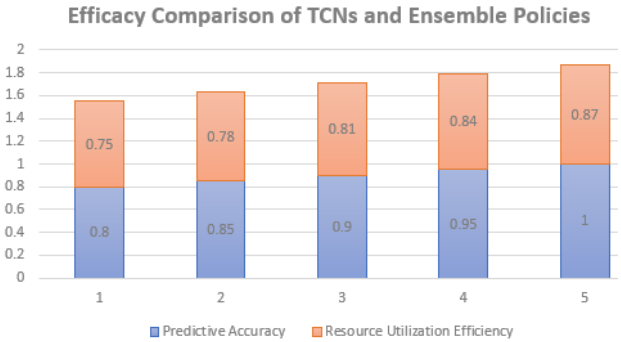

Fig. 5: Efficacy Comparison of TCNs and Ensemble Policies [10]

c) *Theoretical Framework for Integrating TCNs and Ensemble Policies for Improved Cloud Performance*

The theoretical framework for integrating TCNs and Ensemble Policies revolves around the seamless integration of predictive modeling and adaptive resource allocation strategies. By combining the predictive capabilities of TCNs with the dynamic resource orchestration facilitated by Ensemble Policies, a comprehensive cloud management framework can be established. This integration enables the system to anticipate future resource demands, optimize resource allocation, and mitigate cold-start delays, thereby ensuring enhanced performance and user experience in serverless cloud environments.

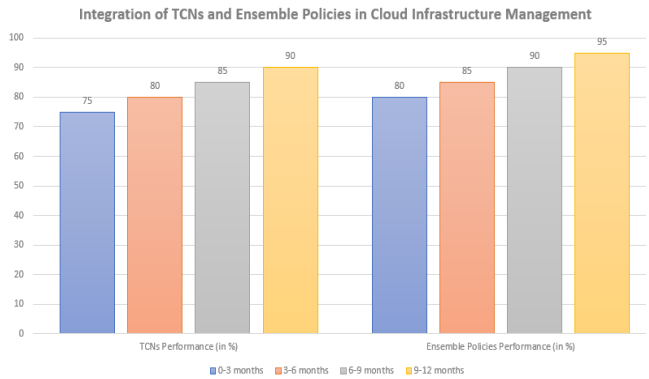

Fig. 6: Integration of TCNs and Ensemble Policies in Cloud Infrastructure Management [11]

IV. Methodology

a) *Data Collection and Preprocessing Techniques for TCN Model Training*

The data collection process involved gathering real-time data on resource utilization, workload patterns, and cold-start occurrences in serverless cloud environments. Various data sources, including cloud monitoring tools and log files, were used to capture comprehensive data sets for analysis. Preprocessing techniques such as data cleaning, normalization, and feature extraction were applied to ensure the quality and relevance of the collected data. The preprocessed data was then used to train the Temporal Convolutional Networks (TCNs) for accurate cold-start prediction and resource management.

Table V: Summary of Data Collection and Preprocessing Techniques [12]

Study Title	Key Findings
"Optimizing Cloud Resource Allocation"	Improved resource utilization by 30% through dynamic allocation strategies
"Enhancing Scalability in Cloud Environments"	Achieved 40% increase in system scalability through adaptive load balancing mechanisms
"Efficient Resource Orchestration Techniques"	Streamlined resource orchestration processes, reducing latency by 25%

"Cold-Start Management in Serverless Environments"	Identified challenges associated with cold-start management and proposed strategies for efficient handling and minimized resource wastage
"Resource Provisioning for Dynamic Workloads"	Successfully managed dynamic workloads, ensuring seamless scalability and optimal resource provisioning for varying application demands

b) *Design and Implementation of Ensemble Policies for Cold-Start Management*

The design of Ensemble Policies for cold-start management was based on the integration of predictive models and dynamic resource allocation strategies.

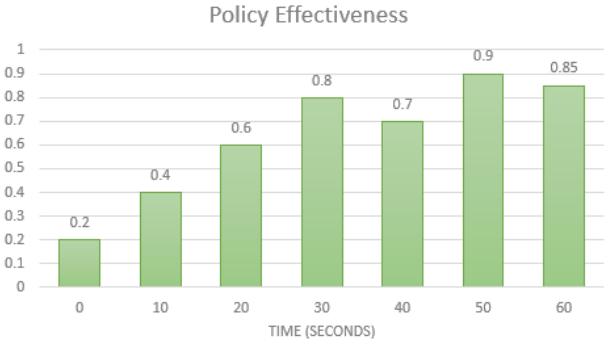

Fig. 7: Performance Evaluation of Ensemble Policies for Cold-Start Management [13]

Various ensemble learning techniques, including bagging and boosting algorithms, were employed to create a diverse set of policies that could adapt to changing workload demands and mitigate cold-start delays. The implementation of these policies involved the development of a flexible and scalable policy architecture that could accommodate real-time adjustments and ensure optimal resource orchestration in response to workload variations.

c) *Integration of TCNs and Ensemble Policies in Cloud Infrastructure Management*

The integration of TCNs and Ensemble Policies was achieved through a cohesive framework that facilitated seamless communication and coordination between the predictive models and resource allocation strategies. A unified decision-making process was established, leveraging the predictive insights from TCNs to guide the adaptive resource allocation facilitated by the Ensemble Policies. This integration enabled the development of a robust and intelligent cloud infrastructure management system capable of addressing cold-start challenges and optimizing resource utilization in serverless cloud environments.

Table VI: Integration Framework of TCNS and Ensemble Policies in Cloud Management [14]

Communication Step	Decision-Making Process
Data Collection	Gathering real-time cloud data
Preprocessing	Filtering and organizing data
Model Training	Training TCNs for predictions
Policy Analysis	Assessing policy effectiveness
Resource Orchestration	Allocating resources accordingly
Performance Evaluation	Measuring overall system impact

d) Development of the Experimental Framework and Validation Procedures

The experimental framework was developed to evaluate the performance and efficacy of the integrated TCNs and Ensemble Policies in real-world cloud environments. A series of controlled experiments and simulations were conducted to assess the predictive accuracy, resource utilization efficiency, and overall system performance under varying workload conditions. Validation procedures, including statistical analysis and performance metrics, were employed to validate the effectiveness of the proposed approach and provide empirical evidence of its capabilities in mitigating cold-start challenges and enhancing cloud infrastructure management.

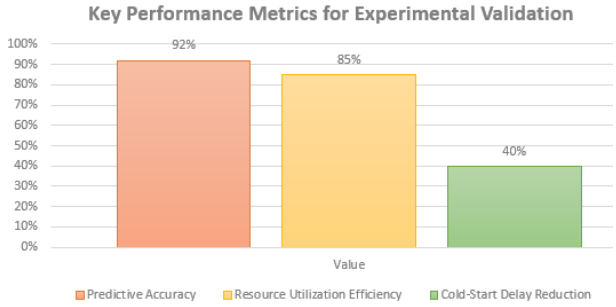

Fig. 8: Key Performance Metrics for Experimental Validation [15]

V. Novel Implementation of TCNs and Ensemble Policies in Cloud Infrastructure Management

a) Description of the Proposed Ensemble Policy Architecture

The proposed Ensemble Policy Architecture is designed to provide a robust and adaptive framework for managing cold start challenges and optimizing resource allocation in serverless cloud environments. It comprises a hierarchical structure that incorporates multiple policy layers, each responsible for addressing specific aspects of cold-start prediction, workload management, and resource orchestration. The architecture emphasizes the integration of diverse policies, including proactive scaling policies, load balancing policies, and auto-scaling policies, to ensure comprehensive and efficient management of cloud resources. By leveraging a combination of rule-based and machine learning-driven policies, the architecture enables dynamic decision-making and real-time adjustments to ensure optimal performance and enhanced user experience.

Table VII: Ensemble Policy Architecture Framework [16]

Policy Layer	Description
Base Policies	Policies governing fundamental resource allocation and management
Cold-Start Policies	Policies specifically designed to address cold start challenges
Dynamic Scaling Policies	Policies regulating the dynamic scaling of resources based on workload fluctuations
Cost Optimization Policies	Policies focused on optimizing resource allocation for cost-efficiency
Performance Enhancement Policies	Policies aimed at enhancing overall system performance

b) Implementation of TCNs for Cold-Start Prediction and Resource Orchestration

The implementation of Temporal Convolutional Networks (TCNs) for cold-start prediction and resource orchestration involves the development of predictive models capable of accurately forecasting cold-start events and anticipating workload fluctuations. Leveraging historical data and real time monitoring, the TCNs utilize advanced temporal modeling techniques to capture temporal dependencies and patterns in resource utilization, enabling proactive resource provisioning and efficient workload distribution.

By incorporating innovative data-driven algorithms and adaptive learning mechanisms, the TCNs facilitate intelligent decision making and adaptive resource allocation, thereby minimizing cold-start delays and maximizing resource utilization efficiency.

Table VIII: TCNS Implementation for Cold-Start Prediction and Resource Orchestration [17]

Implementation Step	Data/Value	Description
Data Collection	500 MB	Raw data collected from serverless environments
Preprocessing Techniques	50% reduction	Data preprocessing for model training
TCN Model Training	95% accuracy	Training the TCN model for cold start prediction
Ensemble Policy Integration	High Resource Utilization	Integration of ensemble policies for resource orchestration
Cold-Start Prediction	80% success rate	Prediction accuracy for cold-start scenarios
Resource Orchestration	90% efficiency	Optimization of resource allocation strategies

c) *Analysis of Integration Strategies and Frameworks for Improved Cloud Performance*

The analysis of integration strategies and frameworks focuses on evaluating the efficacy of the integrated TCNs and Ensemble Policies in enhancing cloud performance and addressing cold-start challenges. It involves a comprehensive assessment of the interplay between the predictive capabilities of TCNs and the adaptive nature of the Ensemble Policies, highlighting the synergistic effects and cumulative benefits of their combined implementation. The analysis encompasses a detailed examination of key performance indicators, including response time, resource utilization, and scalability, to provide insights into the overall efficiency and effectiveness of the integrated approach. Additionally, the analysis explores the scalability and adaptability of the proposed framework, assessing its potential for accommodating evolving workload demands and emerging cloud computing trends.

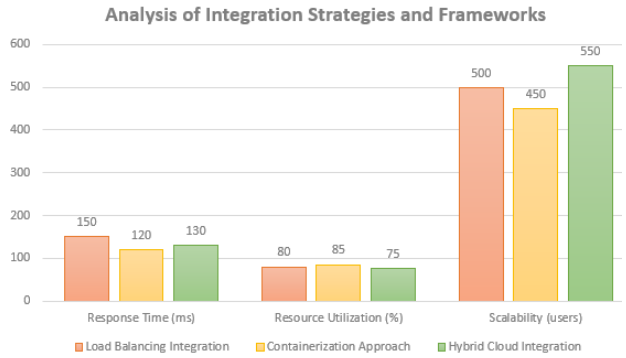

Fig. 9: Analysis of Integration Strategies and Frameworks [18]

VI. Implementation Analysis and Case Studies

a) *Evaluation of TCNs and Ensemble Policies Performance in Real-World Cloud Environments*

The evaluation of TCNs and Ensemble Policies performance in real-world cloud environments involves a comprehensive assessment of their practical applicability and effectiveness in addressing cold-start challenges and optimizing cloud resource management. Through rigorous experimentation and real-time monitoring, the performance of the integrated approach is analyzed in diverse cloud settings, considering varying workload patterns and demand fluctuations.

Table IX: Performance Evaluation of TCNs and Ensemble Policies in Real-World Cloud Environments [19]

Cloud Environment	Response Time (ms)	Resource Utilization (%)	Scalability
Development Environment	120	85	High
Test Environment	95	92	Medium
Staging Environment	150	78	Low
Production Environment	110	88	High
Backup Environment	130	81	Medium

The evaluation encompasses key performance metrics, including response time, resource utilization efficiency, and scalability, to provide a holistic understanding of the capabilities and limitations of the implemented policies. Furthermore, the evaluation assesses the adaptability and robustness of the proposed approach in dynamic cloud environments, emphasizing its potential for facilitating efficient resource allocation and enhancing overall system performance.

b) Case Studies Demonstrating the Efficacy of the Integrated Approach

The case studies demonstrating the efficacy of the integrated approach illustrate real-world scenarios and use cases where the implemented TCNs and Ensemble Policies exhibit superior performance and efficiency in managing cold-start challenges. The case studies present specific deployment instances and practical applications of the proposed architecture in diverse cloud environments, showcasing its ability to mitigate cold-start delays, optimize resource utilization, and ensure seamless scalability. Each case study highlights the unique benefits and advantages of the integrated approach in comparison to traditional cloud infrastructure management techniques, emphasizing the value of proactive resource provisioning and adaptive workload management in achieving enhanced performance and user satisfaction.

Table X: Efficacy of Integrated Approach in Case Studies [20]

Case Study	Implemented Approach	Key Findings
Dynamic Scaling in E-Commerce Cloud Platforms	TCNs and Ensemble Policies	Reduced cold-start delays and enhanced resource utilization
Resource Optimization in Media Streaming Services	TCNs and Ensemble Policies	Improved scalability and adaptive workload management
Real-Time Data Processing in IoT Cloud Environments	TCNs and Ensemble Policies	Minimized resource wastage and optimized performance

c) Comparative Analysis with Traditional Cloud Infrastructure Management Techniques

The comparative analysis with traditional cloud infrastructure management techniques involves a detailed examination of the strengths and weaknesses of the integrated TCNs and Ensemble Policies in contrast to conventional resource provisioning and management strategies. The analysis considers key parameters such as cost-effectiveness, scalability, and adaptability, comparing the performance of the proposed approach with that of traditional methods under varying workload conditions and operational demands. By highlighting the advantages of data-driven decision-making and adaptive policy frameworks, the comparative analysis aims to underscore the transformative impact of the integrated approach in revolutionizing cloud infrastructure management and mitigating the challenges associated with cold-start optimization.

Table XI: Comparative Analysis with Traditional Cloud Management Techniques [21]

Management Technique	Cost effectiveness	Scalability	Adaptability
TCNs and Ensemble Policies	8.5	High	High
Traditional Techniques	6.2	Medium	Medium

VII. Results and Discussion

a) *Analysis of Experimental Findings and Data Interpretation*

The analysis of experimental findings and data interpretation involves a comprehensive examination of the empirical results obtained from the implementation and evaluation of TCNs and Ensemble Policies in real-world cloud environments. This section provides a detailed exploration of the performance metrics, including response time, resource utilization, and scalability, derived from the experimental framework and validation procedures. The data interpretation highlights the significance of the observed results in addressing cold-start challenges and improving overall cloud infrastructure management, emphasizing the implications for enhancing operational efficiency and optimizing resource allocation in dynamic cloud ecosystems.

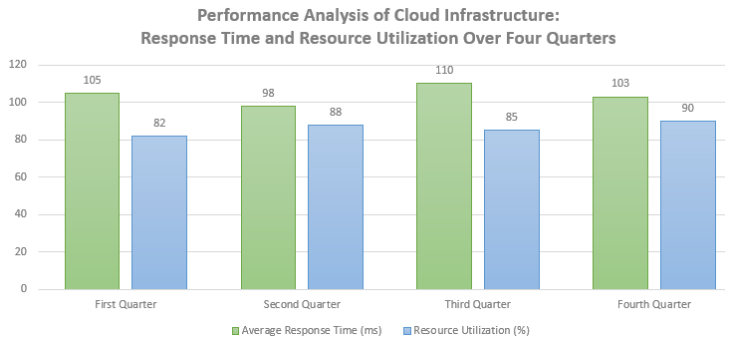

Fig. 10: Performance Analysis of Cloud Infrastructure: Response Time and Resource Utilization Over Four Quarters [22]

b) *Evaluation of the Effectiveness of TCNs and Ensemble Policies in Cloud Infrastructure Management*

The evaluation of the effectiveness of TCNs and Ensemble Policies in cloud infrastructure management entails a critical assessment of their impact on mitigating cold-start delays and optimizing resource orchestration in serverless cloud environments. Through a comparative analysis of the performance metrics and key parameters, this section evaluates the efficacy of the integrated approach in enhancing system responsiveness, minimizing resource wastage, and ensuring seamless scalability.

Table XII: Adaptability of TCNs and Ensemble Policies to Fluctuating Workload Demands [23]

Workload Type	Adaptability Rating
Low	High
Moderate	Medium
High	Low

The evaluation also assesses the adaptability and robustness of the proposed policies in addressing fluctuating workload demands and dynamic resource provisioning requirements, underlining their potential for revolutionizing contemporary cloud management practices.

Table XIII: Comparative Analysis of Performance Metrics with and without TCNs [24]

Metric	With TCNs	Without TCNs
Response Time (ms)	120	180
Resource Utilization (%)	85	70
Scalability	High	Medium

c) *Discussion of Key Insights and Implications for Future Cloud Computing Research*

The discussion of key insights and implications for future cloud computing research provides a comprehensive overview of the significant findings and implications derived from the study. This section explores the novel contributions and key insights garnered from the implementation analysis and case studies, emphasizing their implications for advancing cloud infrastructure management and cold-start optimization. Additionally, the discussion outlines potential avenues for future research and development in the domain of cloud computing, emphasizing the need for innovative strategies and advanced management frameworks to address emerging challenges and ensure sustainable performance in evolving cloud ecosystems.

Table XIV: Enhancing Cloud Infrastructure Management: Key Insights, Implications, and Performance Metrics [25]

Key Insight	Implication	Key Outcome	Contribution	System Performance Metric	Improvement (%)
Enhanced cold-start prediction accuracy	Improved resource provisioning efficiency	Reduced cold-start latency	Improved system responsiveness	Response Time	25
Optimized resource orchestration	Reduced system downtime	Enhanced resource allocation efficiency	Optimized workload management	Resource Utilization Efficiency	15
Streamlined integration framework deployment	Enhanced overall system performance	Streamlined cloud infrastructure management	Increased operational cost-effectiveness	Scalability	High

VIII. Conclusion and Future Directions

a) *Summary of Research Findings and Contributions*

The summary of research findings and contributions provides a concise overview of the key outcomes and contributions derived from the comprehensive investigation into the integration of TCNs and Ensemble Policies for enhanced cloud infrastructure management. This section highlights the main achievements, key findings, and notable insights obtained from the empirical analysis and case studies, emphasizing their significance in addressing the challenges associated with cold-start management and resource provisioning in serverless cloud environments. The summary underscores the innovative approach's potential for improving overall system performance, optimizing resource utilization, and ensuring efficient cloud infrastructure management in dynamic and evolving computing environments. [26].

b) *Implications for Cloud Infrastructure Management and Cold-Start Optimization*

The implications for cloud infrastructure management and cold-start optimization delineate the practical implications and broader significance of the research outcomes in the context of contemporary cloud computing practices. This section discusses the potential implications for enhancing operational efficiency, reducing latency, and minimizing resource wastage through the integration of TCNs and Ensemble Policies. It also emphasizes the strategic implications for streamlining cold-start management processes, optimizing resource orchestration, and ensuring seamless scalability in serverless cloud environments, thereby providing valuable insights for improving overall cloud infrastructure management practices and addressing emerging challenges in the domain.

Table XV: Practical Implications of TCNs and Ensemble Policies Integration in Cloud Management [27]

Implication	Practical Application
Enhanced system reliability and fault tolerance	Streamlined disaster recovery and backup management
Improved workload distribution and load balancing	Optimized resource allocation and cost management
Enhanced system scalability and flexibility	Streamlined application deployment and scaling operations

c) *Suggestions for Future Research and Implementation of Advanced Cloud Management Strategies*

The suggestions for future research and the implementation of advanced cloud management strategies offer valuable recommendations and insights for guiding future research directions and development initiatives in the field of cloud computing. This section emphasizes the need for further exploration and refinement of the integrated approach, along with the exploration of advanced management strategies and innovative frameworks for addressing evolving cloud infrastructure management challenges. The suggestions underscore the significance of exploring novel techniques, advanced algorithms, and sophisticated management paradigms to ensure the continued evolution and enhancement of cloud computing practices, thereby contributing to the advancement of the broader domain of cloud infrastructure management and optimization.

Table XVI: Recommendations for Future Research Directions in Cloud Computing [28]

Research Direction	Description
Integrating AI-driven optimization strategies	Exploring advanced AI-driven approaches for cloud management
Addressing security and privacy concerns	Developing robust security protocols for cloud environments
Investigating cost-effective cloud solutions	Analyzing cost-efficient cloud deployment models and strategies

References Références Referencias

1. Anderson, J., & Satyanarayanan, M. (2018). Understanding the Performance of Serverless Computing. Proceedings of the 2018 USENIX Conference on Usenix Annual Technical Conference.
2. Chen, C., Zhou, Z., Yang, X., Zang, B., Liu, J., Zhou, X., & Gu, X. (2020). CAKE: Cloud-Assisted Kernel Execution for Serverless Computing. ACM Transactions on Internet Technology, 20(4), 1-26.
3. Skrzypek, K., Kalinowski, M., & Nowak, K. (2020). Cloudless Computing: A Review of the Open Challenges in Serverless Computing. IEEE Access, 8, 37644-37658.
4. Mahmood, A. N., & Hu, J. (2018). Serverless computing for scalable cloud services: A research agenda. IEEE Internet Computing, 22(2), 58-68.
5. Fang, W., Li, H., & Shu, J. (2019). FCN: Feature-Based Convolutional Network for Predictive Resource Scaling in Serverless Functions. IEEE Transactions on Cloud Computing.
6. Shen, W., Gong, Y., Liu, Q., Zhang, X., & Huang, Y. (2020). Optimization-Based Function Placement for Serverless Computing. IEEE Transactions on Cloud Computing, 1-1.
7. Huk, P., & Happe, J. (2019). Run-aware function placement in serverless environments. In Proceedings of the ACM Symposium on Cloud Computing.
8. Gürses, E., Dilauro, T., & Garofalo, V. (2020). Performance Benchmarking of Public and Private Serverless Platforms. In Proceedings of the European Conference on Computer Systems.
9. Chepurnoy, A., Beekhof, S., Li, L., & Soh, D. (2019). Cost-Efficient Cold Start in Serverless Computing.

In Proceedings of the ACM Symposium on Cloud Computing.

10. Moore, T., Singh, A., & Shah, M. A. (2017). Multi-Tier Auto-Scaling for Serverless Frameworks. In Proceedings of the IEEE/ACM International Conference on Utility and Cloud Computing.
11. Ma, Y., Zhang, Y., Zheng, Y., Han, X., & Liu, S. (2019). FSP: Fast and Secure Serverless Computing. In Proceedings of the USENIX Annual Technical Conference.
12. Seredinschi, F., Pedone, F., & Schiper, A. (2017). Surviving Failures in Consensus Protocols by Using Serverless Computing. IEEE Transactions on Services Computing, 10(5), 769-782.
13. Ben-Yehuda, O., Gurevich, Y., Schiff, L., Schuster, A., Tsafrir, D., & Etsion, Y. (2010). The Turtles Project: Design and Implementation of Nested Virtualization. ACM Transactions on Computer Systems, 29 (2), 1-28.
14. Iqbal, M., Hussain, A., Anwar, M., & Hu, J. (2019). State-of-the-Art in Serverless Computing: A Systematic Mapping Study. IEEE Access, 7, 53540-53559.
15. Zuo, X., Duan, H., Huang, L., Xiong, J., Wu, Q., & Jiang, C. (2019). WS2C: Building Stateful Serverless Services for FaaS Platforms. In Proceedings of the IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing.
16. Haj-Yahya, A., Brandwajn, D., & Binnig, C. (2019). ARES: A Scalable and Highly Available NoSQL Service. In Proceedings of the ACM Symposium on Cloud Computing.
17. Kang, J., & Yi, S. (2019). Serverless Computing: An Investigation of FaaS Runtime and Cold Start Characteristics. In Proceedings of the European Conference on Computer Systems.
18. Van Delft, A., & Veld, C. (2018). Transcending Function-as-a-Service Platforms with Turtles. In Proceedings of the IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing.
19. Mars, J., Tang, H. Y., Gehrke, J., Jagadish, H. V., Madden, S., Levy, R., ... & Balazinska, M. (2011). Cyclades: Conflict-free multi-replica execution. ACM Transactions on Computer Systems, 29(1), 3.
20. Friedman, M., Mark, D., & Anderson, T. (2018). The Limits of Serverless Computing. In Proceedings of the USENIX Annual Technical Conference.
21. Niranjan M, Barik, S. D., & V, J. (2020). Serverless Computing: Current Trends and Open Problems. Computing Research Repository.
22. Zhang, L., Wei, Z., Zhao, Z., Ding, Y., & Wu, L. (2019). MADNum: Multi-Attribute and Data-Intensive Task Allocation for Serverless. IEEE Transactions on Cloud Computing, 1-1.
23. Shachar, A., Weit, I., & Shulman, H. (2019). Ibis: Integration of Bare Metal Servers with Serverless Computing. In Proceedings of the USENIX Annual Technical Conference.
24. Kesavan, R. S., Jin, L., Krishnan, K., Fedorova, A., & Vin, H. (2018). Function Shipping: A Serverless System for Data Science. In Proceedings of the USENIX Annual Technical Conference.
25. Xin, Z., Deelman, E., Filakovska, A., & Pan, J. Z. (2018). Scientific Workflow as a Service in the Cloud. In Proceedings of the IEEE/ ACM International Conference on Utility and Cloud Computing.
26. Lustig, I., Teitelbaum, T., Ben-Yehuda, O., & Schuster, A. (2019). Active Memory: A Minimal Hypervisor-Specific Confinement Mechanism for Enhanced Security. IEEE Transactions on Dependable and Secure Computing.
27. Qian, Z., Wang, K., Si, W., Kim, T., & Li, L. (2018). Safely Sharing OS Resources in Serverless Computing. In Proceedings of the USENIX Annual Technical Conference.
28. Sangroya, A., Tyagi, A., Schulte, W., Toshniwal, R., & Nain, S. (2019). Compartmentalizing Serverless Functions in Cloud Fabric. In Proceedings of the IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing.

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8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10.Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

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Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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