**CERTIFICATE AUTHENTICATION SYSTEM USING QR CODE**

**CHAPTER ONE**

**1.0 Introduction**

A certificate is a declaration or document that is given to a person or student upon the completion of a certain education, whether it be formal or informal (Singhal and Pavithr, 2015). The school administration uses a system of applications called certificate verification to develop and administer student certificates in a computerized fashion. These certificates can be created, printed, and confirmed. Verifying certificates can be time-consuming, and some institutions may use a third party to help them. The use of information technology has been questioned since universities refuse to provide outside organizations access to their verification database, leaving some or all of the verification process manual (Boukar, Isa and Salisu, 2017). The academic community also faces difficulties when there is fraud or plagiarism in the original texts. The drawback of the method is that such institutions cannot fully verify the legitimacy of the documents. The time-consuming paperwork affects how issuing organizations authenticate papers, which results in an increase in the number of counterfeit certificates in circulation worldwide (Boukar, Isa and Salisu, 2017). As a result, the Quick Response (QR) code and a smartphone QR scanner are used to read, authenticate, and verify the QR code on the certificates. This is a novel, secure, and automated approach that is integrated into the system. Typically, bits of information are encoded using Quick Response code, a two-dimensional barcode that consists of black square dots arranged on a white square grid (Uzun and Bilgin, 2016). They are made to swiftly decipher the data (Pons, 2011). It is the most widely used form of verification system worldwide. It has a large storage capacity, is quick to read, and increases the dependability and security of the current system for awarding university students with degree certificates (Singhal and Pavithr, 2015). Examples of QR Code application systems include the online bank verification system (Mohadikar and Devade, 2013) and the attendance system (Tresnani and Munir, 2011). As a result, this research examines the creation of a Quick Response Code and its integration into a certificate for verification. The references to the students' records that are printed on certificates will be used to create a secure QR code. Any QR code scanner can read the code and decrypt it on a mobile device to validate certificates. The QR-code can be translated and decrypted by any QR code reader. The certificate will be printed with the produced QR code, which contains the student's information. When a mobile QR scanner scans a certificate and doesn't produce any useful information or a website link where the certificate can be checked, the certificate is false (Singhal and Pavithr, 2015).

**1.1 Background of the Study**

With the development of technology and the unceasing expansion in digital data, online data and information are now crucial in the age of the digital world. This calls for their optimization. Data's originality and accuracy are the most crucial factors to consider. In managing data in an internet database, the most difficult problem is determining the validity of the data. Quick Response codes, or QR-codes for short, are two-dimensional (2D) matrix barcodes that can be scanned using a web-capable smart phone's camera and a default application called QR Reader to access some pre-written content like a website address, email address, information about items in the catalog, phone numbers, etc (Hui et al., 2014; Shettar, 2020).

A relatively 2-D zymology known as a QR-code was created by Toyota subsidiary Denso Wave in 1994 with the primary goal of creating a sign that could be quickly and easily read by scanner equipment while carrying more information than traditional barcodes. Unlike QR-code, which has decoded data in both the vertical and horizontal orientations, the conventional Universal Product Code only carries decoded data in one way, or vertically into bars with a house in between. The amount of data that a QR-code can store is greater than that of a barcode, which is even several times as much data (Ahmed & Jang, 2017; Haque & Dybowski, 2014; Shettar, 2020).

The Quick Response Code (QR Code) technology, on the other hand, has grown in popularity as an authentication technique since it can be read quickly and has a large amount of storage space compared to other types of barcodes. The term "QR code" refers to a particular kind of matrix barcode. It can repair errors, is impervious to dirt and damage, and is legible in 360 degrees in all directions. The code's Quick Response features make it an easy method to deliver material to users who are on the go. So, in this work, a QR code with certification technique is suggested. Based on the data included in the produced QR code printed on the certification, the effectiveness of the authentication system for certificates is guaranteed. A QR reader application can seem necessary because it is necessary to scan a QR code in order to access the information contained therein, which can be used to verify a certification.

**1.2 Statement of Problem**

Currently, consumers who wish to verify the authenticity of a certain certification must authenticate the signature on that certification, which can take up to three days to complete owing to the authentication procedure. As a result, research on user-friendly authentication technologies has been produced as a result. In higher education, the usage of faked degree certificates is increasing, according to Jide O. (2020). He stated that it is "heart rending" that there are news reports almost weekly about some very significant personalities being exposed for using fraudulent academic credentials or other forged documents. Companies use a short path since they are only interested in the certificate and don't want to bother going through the authentication process. The population of unemployed people who have certificates in hand has increased as a result of this move. In contrast to individuals who make little investment, it is unjust for those who worked incredibly hard for a long time to obtain a credential. Consequently, a certificate verification mechanism was required.

**1.3 Aim/ Objectives of the Study**

The main aim of this project is to create a QR code-based certificate authentication system.

The following are the objectives:

1. To fix the problem with manual certificate verification.
2. To allow the registrar to create a special certificate code automatically for each certificate added.
3. To make it simple for students and employers to verify the validity of any certificate.

**1.4 Scope of the Study**

This research work will concentrate on registration, adding of certificates, Student management, generating a QR code for certificates of students of Computer Science, The Federal Polytechnic Bida.

**1.5 Limitation of the Study**

The proposed certificate authentication system is limited to only certificates of students of computer science of the Federal Polyethnic Bida.

**1.6 Signification of the Study**

The goal of this study was to assist and benefit students, faculty, administration, and anybody else looking to confirm the legitimacy of a school certificate. The verification system would increase the ability of individuals who maintain the system to monitor it. Additionally, the registrar would receive clear instructions on how to add and create the student's certificates, allowing them to print them quickly and appropriately.

**1.7 Definition of Terms**

**Registration:** this means to keep records received from the management for reference purposes.

**Management:** It is the co-ordination of all the resources of an Organization through the process of planning, Organization, directing and controlling

**System:** Physical component of a computer that is used to perform a certain task.

**Data:** Numbers, Text or image which is in the form of suitable for storage in or processing by a computer, or incomplete information.

**Information:** A meaning full material derived from computer data by organizing it and interpreting it in a specified way. Information System: A set of interrelated components that collect (or retrieve), process, store and distribute information to support decision making and control in an organization.

**Software:-**Software is set of related programs that are designed by the manufacturer to control the hardware and to enable the computer to perform a given task.

**Hardware:** - Hardware is a physical part of a computer that can be touched, seen, feel which are been control by the software to perform a given task.

**Database:** - Database is the collection of related data in an organized form.

**Programming:** - programming is a set of coded instruction which the computers understands and obey.

**Technology:** -Technology is the branch of knowledge that deals with the creation and use technical and their interrelation with life, society, and the environment, drawing upon such as industrial art, engineering, applied science and pure science.

**Algorithm:** A set of logic rules determined during the design phase of a data matching application. The ‘blueprint’ used to turn logic rules into computer instructions that detail what step to perform in what order.

**Application:** The final combination of software and hardware which performs the data matching.

**Data matching database:** A structured collection of records or data that is stored in a computer system.

**CHAPTER TWO**

**2.0 Literature Review**

Today, certificate verification is a crucial responsibility. It is the procedure of confirming the validity and ownership of a certificate that was awarded following the conclusion of a certain educational phase (Singhal and Pavithr, 2015). A certificate must also be checked to confirm that its information is accurate and that the entity from whom it was issued is recognized. Certificates are written and printed on specific paper, and they have grown to be an essential part of applying for jobs and pursuing higher education.

However, with the advancement of counterfeiting technology, counterfeit degrees have become quite prevalent, which is why verification is crucial (Ghazali and Saleh, 2016). In order to avoid the thought of Certificate forgery, a QR code and smart phone were presented as solutions to the attendance system for both students and employees (Cho and Bae, 2014; Kumar and Kareemulla, 2017; Masalha and Hirzallah, 2014). The online approach for tracking attendance that these researchers suggested required lecturers to create QR codes that students would then scan and send through wired or wireless networks for the requisite automatic attendance checks (Cho and Bae, 2014; Masalha and Hirzallah, 2014). The introduction of voice and fingerprint verification for identification to prevent proxy attendance was the main extension made by the work of Kumar and Kareemulla in 2017. Additionally, a new QR Code that increases security for document identification was developed in 2016. (Revathi, Annapandi and Ramya, 2013). In order to eliminate fake certificates, this system uses biometric finger print scanners and QR readers to check the authenticity of the certificate. In this approach, the emphasis is on leveraging the certificate's image to create a QR code and the user's finger print as it runs.

A novel Confidential Encrypted Data Hiding and Retrieval Using QR Authentication System was created by Dey, Nath, and Agarwal in 2013. In this system, each student's vital information, including name, roll number, registration number, semester and year of study, marks earned in various subjects, and grades earned, are kept in the QR Code. But before the QR Codes are written in the student's grade sheet, all the data that is saved and encoded in them is encrypted. Therefore, in the future, the QR Code can be scanned and the contained information can be decrypted if the student or any other person wants to view their grades digitally or send academic material to any university or organization in digital format and sentAs a result, if an intruder tries to change the marks on the mark sheet, it will be impossible in the QR Code since the encryption key is unknown. This research provided a novel approach in which the marks received by a candidate would also be encoded in QR Code in encrypted form. Al-Khalifa (2008) also stressed the growing importance of cell phones in our life. Our lives are now considerably simpler than they were in the past thanks to the comfort and convenience they offer. The inclusion of digital cameras and the availability of Internet access from any location are two excellent characteristics of contemporary cell phones that help us find information when we need it. People who are blind or visually impaired (VI) can also benefit from this capability in current mobile phones. Additionally, with the development of speech technologies for mobile devices like Nuance TA, which speaks the text that is displayed on the device, blind and visually impaired (VI) people can now readily engage with mobile devices in the same way that sighted people do. It is extremely promising to use the 2D barcode capabilities of modern mobile phones to help the visually impaired (VI) and the blind identify objects in their environment. In contrast to certain pricey assistive technology, our proposed approach leverages mobile phones, which are reasonably priced, portable, and almost universally used by blind persons to vocally identify objects marked with 2D barcodes. In order to better serve their visitors and accomplish their overall institutional goals, Schultz (2013) noted that libraries and museums are increasingly turning to mobile technologies, such as quick response codes. However, there is a dearth of data regarding patrons' perceptions of quick response codes. This case study investigated how visitors and personnel at Ryerson University Library and the museums perceived rapid response quick response codes.

Through the use of an algorithm, encryption transforms data or information that is typically in plaintext such that accessing it requires specific knowledge. Typically, this unique information is referred to as a key. Something is encrypted, for instance, if accessing it requires entering a password. Since no human eye can interpret Quick Response codes (QR codes), they might be regarded as encrypted messages. Because of this, QR codes have been utilized by many people for a wide variety of purposes. This list only keeps growing and expanding across a number of industries. Since most QR codes are used for marketing and the creators want them to be accessible to everyone, they are not very widespread. Apart from that, programs are currently available to use encrypted QR codes for business marketing on product packaging, advertisements, show window displays, and more. The fact that this application was created with the customer in mind ensures that any copyrights associated with any product elements, designs, or trademarks used for inclusion in the bespoke QR codes belong to the customer.