THE EFFECTIVENESS OF QR CODES IN ENHANCING INFORMATION RETRIEVAL IN ACADEMIC LIBRARIES: A STUDY OF UNIVERSITY OF BENIN

BY

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EDU2005711

DEPARTMENT OF EDUCATIONAL MANAGEMENT

UNIVERSITY OF BENIN

BENIN CITY, NIGERIA

MARCH, 2025

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A PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL MANAGEMENT, FACULTY OF EDUCATION, UNIVERSITY OF BENIN IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR DEGREE IN LIBRARY AND INFORMATION SCIENCE (BLIS)

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CERTIFICATION

We, the undersigned, hereby certify that this research work was carried out by IKPONMWOSA PRECIOUS ONYENWEN with Matriculation Number: EDU2005711 of the Department of Educational Management, Faculty of Education, University of Benin, Benin City in partial fulfillment of the requirements for the Award of Bachelor of Science Degree (B.Sc. Ed) in Library and Information Science.

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DEDICATION

The work is dedicated to my wonderful parents, Mr. and Mrs. Ikponmwosa.

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ABSTRACT

The study investigated the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin. To achieve the purpose of the study, four research questions were raised and answered. The sample size for the study was made up of 100 professional and paraprofessional staff in John Harris Library, University of Benin, Benin City. This is made up of 13 professionals and 87 paraprofessionals. The questionnaire was the instrument for data collection. The descriptive survey research design was adopted for the study. An analysis of data was done using frequency count and percentages. The findings from the study include that QR codes play a pivotal role in enhancing information retrieval in academic libraries in University of Benin by improving access, navigation, and user interaction within the library system. It was concluded that strategies that can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin include staff training, awareness campaign on QR codes usage, Strategic placement of QR codes, regular update of QR code links and integrating QR codes into library resources. The study recommended among others that the University of Benin school management should conduct periodic training sessions for library staff to enhance their proficiency in creating, managing, and troubleshooting QR codes. This will ensure seamless support for users and improve the overall effectiveness of QR code integration.

CHAPTER ONE

INTRODUCTION

Background to the Study

The use of QR (Quick Response) codes has emerged as a powerful tool for enhancing information retrieval in academic libraries, offering an innovative solution to bridge the gap between physical and digital resources. QR codes, which can be easily scanned with smartphones and tablets, allow library users to instantly access a wide range of digital content such as e-books, journals, databases, and instructional videos (Nabofa, 2023). This technology enhances user experience by simplifying the process of retrieving information, eliminating the need for time- consuming manual searches. Furthermore, QR codes can be strategically placed on bookshelves, catalogues, or library websites to guide students and researchers directly to relevant resources, increasing both efficiency and user engagement.

A QR (Quick Response) code is a type of two-dimensional barcode that stores information in a matrix of black and white squares, which can be read by a QR scanner or any smartphone camera (Aliyu, 2020). Unlike traditional barcodes, which store data only in a linear format, QR codes are capable of storing significantly more information in a smaller space, making them highly versatile. Invented in 1994 by the Japanese company Denso Wave, QR codes were initially used for tracking parts in the manufacturing industry but have since gained widespread popularity due to their fast readability and

capacity to store a variety of data types. These codes can store alphanumeric information, URLs, or even multimedia content, and the ability to encode so much data within a simple pattern makes them useful in a wide array of fields, including marketing, education, and healthcare.

QR codes have the advantage of being able to be scanned from multiple angles, offering greater flexibility compared to traditional barcodes. Once scanned, they provide quick access to the embedded information, which can be a website, a contact card, a PDF file, or any other digital resource. This ease of use and efficiency in connecting physical objects to digital information has made QR codes an integral part of modern technology, especially in the context of smartphones and tablets, which can effortlessly interpret the codes with built-in camera features (Abubakar, 2022). Furthermore, the simplicity of creating and implementing QR codes has led to their widespread adoption in information retrieval.

Information retrieval (IR) refers to the process of obtaining relevant information from a large collection of resources, typically in digital format. It involves searching, locating, and presenting information that meets specific user needs, often through queries (Emenike, 2019). In today's technological world, information retrieval systems are commonly employed in search engines, databases, and digital libraries. These systems help users find relevant documents or data by processing keywords, metadata, and algorithms to rank and present results. The process involves multiple stages, including

query formulation, document indexing, search, and ranking. For instance, when a user types a query into a search engine like Google, the engine scans its index, locates potential matches, and ranks them based on relevance using sophisticated algorithms. The goal is to provide the user with the most accurate and useful results possible, making it a vital tool in managing the vast amounts of information available in the digital age.

Information retrieval goes beyond simple keyword matching; it often incorporates techniques such as natural language processing, machine learning, and relevance feedback to refine the quality of the search results. For example, relevance feedback allows the system to improve its future searches based on user interactions with the current search results. It can also deal with unstructured data, such as documents, images, and audio files, making it applicable in diverse fields like legal research, healthcare, and academic environments (Ribadu, 2021). Additionally, information retrieval systems are designed to handle complex queries, helping users navigate through various types of data with speed and precision. By organizing and filtering large volumes of data, IR plays a crucial role in ensuring that relevant, actionable information is easily accessible, improving decision-making, learning, and research processes across different sectors.

The role of QR codes in enhancing information retrieval in academic libraries cannot be overemphasized. QR codes have become a transformative tool in academic libraries, revolutionizing the way students and researchers access information. One of the primary roles of QR codes is their ability to provide seamless access to digital resources.

By embedding QR codes into books, journals, and other physical library materials, students can quickly access supplementary content such as e-books, research databases, and academic papers without needing to manually search for these resources (Kalu, 2020). This immediacy not only saves time but also makes research more efficient by enabling students to retrieve relevant information with a simple scan using their smartphones or tablets. Libraries can also place QR codes on posters, flyers, and other promotional materials to direct students to relevant online catalogs, study guides, or library services. This approach enhances accessibility, particularly for students who may not be familiar with the library's organizational structure or who are studying remotely. In this way, QR codes bridge the gap between physical and digital spaces, making academic libraries more interactive and user-friendly.

Moreover, QR codes enhance information retrieval by supporting the personalization of learning experiences. Libraries can create QR codes that link directly to subject-specific resources or curated reading lists, providing students with tailored information based on their academic needs (Komonibo, 2022). For example, a QR code located in the law section of the library could lead students to a curated list of the latest legal journals, case studies, or government publications. Additionally, QR codes can support real-time updates, giving libraries the ability to frequently update their digital content without changing physical signage or resources. This makes it easier for students to access the most up-to-date information on academic events, workshops, or newly acquired materials. The ease of integration, minimal cost, and flexibility of QR codes

make them an essential tool for modern academic libraries, ensuring that users can access relevant information swiftly and efficiently in an increasingly digital age (Omoh, 2019).

Statement of the Problem

In contemporary times, despite the rapid advancement in digital technology and the global shift towards innovative tools like QR codes for information retrieval, preliminary observation has shown that many academic libraries seem to be lagging behind in adopting this transformative technology. Preliminary observations suggest that academic libraries, which are meant to serve as hubs of knowledge and resource access seems not to be fully utilizing the potential of QR codes to enhance the speed and efficiency of information dissemination. This underutilization of QR codes is concerning, especially as the technology could significantly streamline access to library resources such as e-books, research papers, and databases.

Moreover, preliminary observation has shown that instead of leveraging QR cods to meet the growing needs of students and researchers, it has been observed that academic libraries seem to be stuck with traditional methods that are time-consuming and less efficient. Without adequate adoption of QR codes, academic libraries may fail to keep pace with contemporary trends in information technology, which is crucial for ensuring timely and seamless access to resources in today's digital age. Thus, in an era where quick access to information is pivotal for academic success, the failure to integrate QR codes into library services may limits users' ability to retrieve essential resources

efficiently. Hence, this study sought to examine the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin.

Purpose of the Study

The main purpose of the study is to examine the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin. Specifically, the study seeks to:

1. find out the level of awareness of the use of QR codes in academic libraries in University of Benin;
2. ascertain the extent QR codes are used for information retrieval in academic libraries in University of Benin;
3. examine the roles of QR codes in enhancing information retrieval in academic libraries in University of Benin;
4. highlight strategies to be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin.

Research Questions

The following questions were raised to guide the study:

1. What is the level of awareness of the use of QR codes in academic libraries in University of Benin?
2. To what extent are QR codes used for information retrieval in academic libraries in University of Benin?

3. What are the roles of QR codes in enhancing information retrieval in academic libraries in University of Benin?
4. What strategies can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin?

Significance of the Study

The study would benefit students, librarians, University of Benin school management, Ministry of Education and prospective researchers. The study would benefit students as it will help highlights how QR codes can simplify and speed up the retrieval of academic resources, making it easier for students to access relevant information instantly via their smartphones.

The study would benefit librarians as it will help them see the potential of QR codes to make library services more efficient. Librarians can save time by reducing the need to manually assist students in locating resources, allowing them to focus on more specialized tasks.

The study would benefit the University of Benin school management as it will help them see the benefit of enhancing the library's service delivery through innovative technology such as QR codes. It will help them see how QR codes can help improve the efficiency of resource management, making the institution a model for modern library practices and attracting more students who value such innovation.

The study would benefit the Ministry of Education as it will help underscores the potential of integrating modern technologies into academic libraries across institutions. It will emphasizes the importance of adopting tools like QR codes to improve access to educational resources and align with global trends in education.

Prospective researchers will find the study useful as it will add to the growing body of knowledge on technology in library science. It will provides a foundation for further exploration into the use of QR codes and similar innovations, offering insights into how technology can transform information retrieval.

Scope and Delimitation of the Study

The study focused on the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin.

The study was delimited to the librarians and users of John Harris Library, University of Benin.

Definition of Terms

The following terms were defined in the study:

Academic Libraries: Academic libraries are libraries that are associated with higher education institutions, such as universities, colleges, and research institutes.

Information Retrieval: Information retrieval (IR) refers to the process of obtaining relevant information from a large collection of resources, typically in digital format.

QR Codes: A QR (Quick Response) code is a type of two-dimensional barcode that stores information in a matrix of black and white squares, which can be read by a QR scanner or any smartphone camera.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

In this chapter, the review of related literature was discussed under the following sub-headings:

- **Conceptual Framework:**
- Concept of QR Codes
- Concept of Academic Libraries
- Concept of Information Retrieval
- Level of Awareness of the use of QR Codes in Academic Libraries
- Extent QR Codes are Used for Information Retrieval in Academic Libraries
- Roles of QR Codes in Enhancing Information Retrieval in Academic Libraries
- Strategies to Improve the Integration and Use of QR Codes for Information Retrieval in Academic Libraries
- **Review of Empirical Studies**
- **Summary of Literature Review**

Conceptual Framework

The conceptual framework for this study encompasses the key concepts of QR codes, academic libraries, and information retrieval, each playing a crucial role in shaping the research focus. QR codes serve as a technological bridge enabling quick and

efficient access to digital resources, while academic libraries are positioned as hubs for knowledge dissemination and innovation. Information retrieval, on the other hand, forms the backbone of how users navigate and extract valuable information within these libraries. The conceptual framework in this study which include the concepts of QR codes, academic libraries and concept of information retrieval will be discussed subsequently as follows:

Concept of QR Codes

A QR (Quick Response) code is a type of two-dimensional barcode that stores information in a matrix of black and white squares, which can be read by a QR scanner or any smartphone camera (Aliyu, 2020). Unlike traditional barcodes, which store data only in a linear format, QR codes are capable of storing significantly more information in a smaller space, making them highly versatile. Invented in 1994 by the Japanese company Denso Wave, QR codes were initially used for tracking parts in the manufacturing industry but have since gained widespread popularity due to their fast readability and capacity to store a variety of data types. These codes can store alphanumeric information, URLs, or even multimedia content, and the ability to encode so much data within a simple pattern makes them useful in a wide array of fields, including marketing, education, and healthcare.

Akasi (2020) opined that the use of QR codes has grown significantly over time, expanding from industrial applications to a wide range of everyday uses, largely due to

the proliferation of smartphones. In marketing, QR codes have become a powerful tool to bridge the gap between physical and digital content. Companies and marketers can place QR codes on products, advertisements, or printed materials, enabling consumers to quickly access additional information, promotional content, or even make purchases directly from their mobile devices. Beyond marketing, QR codes have also found applications in various fields such as healthcare, education, and public services (Oseni, 2019). For instance, they are used to provide patients with access to medical records, offer students access to educational resources, and allow citizens to access government services more conveniently.

The global COVID-19 pandemic further accelerated the adoption of QR codes, particularly in the realm of contactless transactions and information sharing. To minimize physical contact and reduce the spread of the virus, many businesses and organizations adopted QR codes as a safe alternative for interactions (Edekpeme, 2022). Restaurants, for example, replaced physical menus with QR codes, allowing customers to view menus on their phones. Similarly, event organizers and public venues used QR codes for check-ins, digital tickets, and contact tracing. The ease of generating and scanning QR codes, combined with their ability to seamlessly integrate with mobile technology, has cemented their importance in the modern digital landscape. As technology continues to evolve, QR codes are likely to remain a key tool in how we interact with information in both physical and digital environments, continuing to provide a bridge between the two worlds.

Over the years, the evolution of Quick Response (QR) codes has been marked by continuous innovation and adaptation to meet the growing demands of the digital age. Initially, QR codes were primarily used in industrial settings for inventory management and logistics, but their potential for broader applications soon became apparent (Yusuf, 2020). As mobile technology advanced, particularly with the advent of smartphones equipped with high-resolution cameras and internet connectivity, QR codes became more accessible to the general public. This shift was further supported by the development of user-friendly QR code generators and scanners, which made it easier for businesses and individuals to create and interact with QR codes. Today, QR codes are no longer limited to simple text or URL links; they can be customized with logos, colors, and even embedded multimedia content, enhancing their visual appeal and functionality. This adaptability has allowed QR codes to thrive in diverse environments, from retail and marketing to education and healthcare (Ogunleye, 2019).

The future of Quick Response (QR) codes appears promising as they continue to evolve and integrate with emerging technologies. With the rise of augmented reality (AR), QR codes are being used to create immersive experiences, allowing users to interact with digital content in real-world settings (Adewale, 2021). For example, scanning a QR code on a product could trigger a 3D animation or provide an interactive tutorial. Additionally, the integration of QR codes with blockchain technology is being explored to enhance security and traceability in areas such as supply chain management and digital identity verification. As the Internet of Things (IoT) expands, QR codes are also being utilized to

connect physical objects to the digital ecosystem, enabling smarter, more connected environments. Given their versatility and ease of use, QR codes are likely to remain a vital tool in the digital world, continuously adapting to new technological advancements and user needs.

Concept of Academic Libraries

Academic libraries are specialized resource center designed to meet the needs of students, faculty, and researchers within a university, college, or other higher education setting. Its primary function is to support the institution's educational and research goals by offering a wide range of academic materials, such as books, scholarly journals, databases, and electronic resources. Unlike public libraries, which cater to general audiences, academic libraries focus on providing research-driven content across various fields of study (Ochei, 2022). These libraries also offer services like research support, information literacy training, and access to rare collections. Modern academic libraries often utilize technology, including online catalogs, digital repositories, and QR codes, to make accessing information more efficient. By fostering a conducive learning atmosphere, academic libraries play an integral role in helping students and researchers achieve academic excellence and expand their knowledge.

Bakare (2023) asserted that academic libraries offer a wide range of services that are crucial to the academic success of students and the research efforts of faculty. These services often include research assistance, where librarians guide users in finding and

evaluating information relevant to their studies. Many academic libraries also provide information literacy instruction, teaching students how to effectively search for, evaluate, and use information in their academic work. This instructional role is increasingly important in the digital age, where information is abundant, but the ability to discern credible sources is critical. Academic libraries may also offer specialized services, such as data management support for researchers or access to archives and special collections that contain rare or unique materials (Zubairu, 2020).

The physical space of academic libraries is also a significant aspect of their contribution to the academic environment. These libraries are often designed to provide conducive spaces for study, research, and collaboration. They typically include quiet study areas for individual work, group study rooms for collaborative projects, and technology-equipped spaces for multimedia production or digital research (Taiwo, 2021). The design and layout of academic libraries are often reflective of the evolving needs of their users, incorporating both traditional study spaces and modern, flexible learning environments. In many cases, libraries serve as central hubs on campus where students and faculty can access resources, receive support, and engage in scholarly activities.

In the digital age, academic libraries have increasingly expanded their roles to include the management of digital resources and the provision of online services. Many academic libraries offer access to electronic databases, e-books, and online journals, which can be accessed remotely by students and faculty (Ezenagu, 2019). This expansion

into digital services ensures that the library's resources are available to users regardless of their physical location. Additionally, academic libraries often provide platforms for institutional repositories, where faculty and students can publish and preserve their research outputs. These repositories help to disseminate scholarly work to a broader audience, both within and outside the institution. The evolution of academic libraries into digital and hybrid spaces underscores their ongoing relevance in supporting the academic mission of higher education institutions (Uvo, 2020).

The evolution of academic libraries reflects broader trends in education and technology, particularly the shift towards digital learning and open access to information. In response to these changes, many academic libraries have adopted new technologies and services that enhance their ability to meet the needs of a diverse and increasingly digital-savvy user base (Babalola, 2022). For example, the integration of library services with learning management systems (LMS) allows students and faculty to seamlessly access library resources within their online courses. Moreover, academic libraries are increasingly involved in supporting open educational resources (OER), which are freely accessible teaching and learning materials that reduce the cost of education and promote equity in access to knowledge. By supporting initiatives like OER, academic libraries contribute to the democratization of knowledge, ensuring that educational resources are accessible to all, regardless of financial barriers (Okposio, 2019).

Academic libraries play a crucial role in fostering a culture of academic integrity and scholarly communication. They often provide guidance on proper citation practices, helping students and researchers avoid plagiarism and correctly attribute sources in their work. Academic libraries also support the development of academic writing and research skills through workshops, tutorials, and one-on-one consultations. Academic libraries are key players in the scholarly publishing process, often managing institutional repositories and offering support for open access publishing. This involvement in scholarly communication helps to ensure that research outputs are disseminated widely and ethically (Chidalu, 2023). By promoting best practices in research and publication, academic libraries help to uphold the standards of academic excellence and contribute to the advancement of knowledge in various fields.

Concept of Information Retrieval

Information retrieval (IR) represents a sophisticated field within computer science and information management, focused on locating and retrieving relevant data from massive, often digital, repositories based on user queries. Unlike the simplistic notion of mere keyword searching, information retrieval encapsulates a range of techniques and processes aimed at understanding, indexing, and fetching information that accurately aligns with user intentions and needs (Yahaya, 2023). The discipline arose as a response to the exponential growth of information in digital formats, where manual searching became impractical. Consequently, information retrieval systems have been engineered to help users sift through enormous datasets, employing complex algorithms that determine

relevance based on various factors, including the context of the query, data structure, and patterns in user behavior.

Bello (2022) opined that the concept of information retrieval rests heavily on data organization principles, where systems index content to make search and retrieval more efficient. In practice, indexing creates a structured repository that the system can reference quickly to locate data points when a query is made. Information retrieval encompasses multiple stages, from data collection, storage, and indexing to the actual retrieval and ranking of results. Each stage is meticulously designed to transform unstructured data into a retrievable format that meets a user's search objectives. For example, data retrieved may vary widely in structure, ranging from documents, audio-visual media, and datasets to fragmented and context-specific digital information. As a result, information retrieval models must adapt to accommodate diverse content types, building flexibility in data processing that enables users to retrieve information relevant to their exact needs efficiently (Uchendu, 2023).

Nwafor (2019) asserted that information retrieval employs both statistical and semantic methodologies to refine the retrieval process. Statistical methods often involve analyzing word frequency and occurrence patterns within documents, while semantic methods apply natural language processing (NLP) and machine learning to interpret user queries beyond literal words, enhancing the accuracy of results. Semantic search, a crucial advancement in information retrieval, allows systems to interpret the meaning of

queries rather than relying solely on keyword matches, making it possible to deliver results that align with user intent more precisely. This approach is vital in areas where information is context-sensitive, such as medical research or legal databases, where the accuracy of retrieved data can significantly impact the outcome of decisions (Onuoha, 2021). As information retrieval systems continue to integrate advancements in artificial intelligence (AI), they become more adept at processing user interactions to refine future search results, offering an iterative, learning-based approach to information retrieval.

Anyanwu (2023) asserted that the effectiveness of information retrieval systems depends on their capacity to manage large volumes of data in a time-sensitive manner, with relevance ranking algorithms designed to prioritize data based on predicted usefulness to the user. This ranking process considers various factors, including user feedback, search history, and personalized content adjustments. The integration of user feedback mechanisms further refines this ranking, as information retrieval systems learn from user behavior patterns, enabling continuous improvement in data accuracy and relevance. Therefore, Information Retrieval, through its structured yet adaptive approach, not only enhances information accessibility but also plays a foundational role in fostering informed decision-making and knowledge discovery in our information-rich world (Okoro, 2022).

Level of Awareness of the use of QR Codes in Academic Libraries

The level of awareness regarding the use of QR codes in academic libraries across Nigeria varies widely, shaped by factors such as institutional support, staff training, and digital literacy among students and library users. QR codes, which enable users to quickly access information or resources via a smartphone or tablet, have the potential to streamline information access in academic settings (Agwuegbo, 2020). In more digitally progressive institutions, QR codes have gained moderate awareness, largely due to their integration in promoting library services and resources, making them familiar tools among students and staff. Some universities, for instance, use QR codes to link students to digital resources, including e-books, journals, and online catalogs, allowing for efficient access. Despite these efforts, however, awareness remains limited in several Nigerian academic institutions, particularly in rural or under-resourced areas (Kikelomo, 2022). For many students and staff, the primary challenges are the lack of exposure to QR technology, limited understanding of its benefits, and insufficient access to smartphones or internet data. Consequently, the level of awareness of QR code applications in Nigerian academic libraries remains relatively low on average, with only a few institutions fully embracing their use.

Several studies conducted by scholars has shown the level of awareness of the use of QR codes in academic libraries in Nigeria. Adeyemi (2022) conducted a study on the assessment of the level of awareness regarding the use of QR codes in academic libraries at the University of Ilorin. The researcher aimed to investigate how familiar library users were with QR codes as tools for accessing library resources and services. The study was

structured around four research questions and a null hypothesis. Employing a descriptive survey design, the research involved a sample of 130 respondents. Data were collected using a structured questionnaire focused on user awareness of QR codes in the library context. Mean and standard deviation were utilized to analyze the research questions, while a t-test statistic was applied to test the null hypothesis at a 0.05 significance level. The findings indicated a moderate level of awareness among library users about the use of QR codes at the University of Ilorin.

Khalid (2023) explored the level of awareness of QR codes in academic libraries at Bayero University, Kano. The researcher aimed to evaluate how well library users recognized and understood the functionality of QR codes in facilitating access to library resources. The study was guided by five research questions and one null hypothesis. Using a descriptive survey design, the research included a sample of 150 respondents selected from the library's user community. Data were collected through a structured questionnaire that assessed users' awareness of QR codes. Mean and standard deviation were calculated for the research questions, while the t-test was used to analyze the null hypothesis at a 0.05 significance level. The results revealed a significant low level of awareness of QR codes among library users at Bayero University Kano.

Nwankwo (2022) conducted research on the level of awareness regarding the use of QR codes in academic libraries in Nnamdi Azikiwe University. The study aimed to assess how informed students and faculty members were about QR codes as tools for

enhancing access to information resources. Guided by three research questions and a null hypothesis, the study employed a descriptive survey design with a sample size of 180 respondents from the university's library. Data were collected using a structured questionnaire focusing on users' awareness of QR codes. Mean and standard deviation analyses were performed for the research questions, and the t-test statistic was utilized to assess the null hypothesis at a 0.05 significance level. The study found that while there was high level of awareness about QR codes among users in Nnamdi Azikiwe University.

Extent QR Codes are used for Information Retrieval in Academic Libraries

QR codes are increasingly utilized in academic libraries in Nigeria, serving as convenient tools for information retrieval and resource access. The extent of their use can be observed in how libraries incorporate QR codes to bridge traditional library services with digital resources, allowing students and faculty easy access to e-books, journals, databases, and online catalogues (Nwaigwe, 2021). Libraries place QR codes on bookshelves, computer terminals, and other strategic locations to assist patrons in accessing digital resources through their smartphones, which is especially beneficial in an era where mobile device usage is prevalent. This convenience makes QR codes a powerful tool, allowing library users to bypass the traditional process of catalog searching, which can be time-consuming. By scanning a QR code, students and researchers can directly access materials, reducing wait times and minimizing the need for physical interaction with library staff, which is particularly helpful in managing large student populations (Orji, 2019).

However, despite their potential, the use of QR codes for information retrieval in Nigerian academic libraries faces certain limitations. For instance, while urban-based institutions with sufficient technological infrastructure may readily adopt and integrate QR codes into library services, many libraries in rural and under-resourced institutions struggle with limited internet access, outdated technology, and low digital literacy among users. These challenges restrict the reach and impact of QR codes, limiting their ability to become a universal tool for information retrieval across Nigerian academic libraries (Udechukwu, 2023). Additionally, there is a gap in user awareness and training regarding the advantages of QR code use for information retrieval, which hampers widespread adoption. Thus, although QR codes hold great potential for revolutionizing information access in academic libraries, the extent of their use remains uneven across the country, indicating a need for infrastructural upgrades and digital literacy initiatives to maximize their effectiveness.

Lawal (2022) conducted a study on the extent to which QR codes are utilized for information retrieval in academic libraries in University of Ibadan. The researcher aimed to evaluate how effectively QR codes facilitate access to library resources among users. The study was guided by four research questions and one null hypothesis. Using a descriptive survey design, the research included a sample of 124 respondents from the library's user base. Data were collected through a structured questionnaire focusing on the use of QR codes for information retrieval. Mean and standard deviation were employed to analyze the research questions, while the t-test statistic was used to test the null

hypothesis at a 0.05 significance level. The findings revealed that QR codes are moderately used for information retrieval in the academic libraries of the University of Ibadan.

Bamidele (2023) examined the extent to which QR codes are employed for information retrieval in academic libraries at Lagos State University. The researcher aimed to determine how effectively QR codes are integrated into library services to enhance user access to information resources. The study was guided by five research questions and a null hypothesis. A descriptive survey design was utilized, involving a sample of 160 respondents selected from the library's clientele. Data were collected using a structured questionnaire focusing on the usage of QR codes for information retrieval. Mean and standard deviation analyses were conducted for the research questions, while a t-test was employed to test the null hypothesis at a 0.05 significance level. The results indicated a high significant level of usage of QR codes for information retrieval among users at Lagos State University, although there were areas for improvement.

Nnadi (2022) conducted research to explore the extent of QR code utilization for information retrieval in academic libraries in University of Nigeria, Nsukka. The study sought to assess how extensively QR codes are used by students and faculty for accessing library resources. The research was guided by three research questions and a null hypothesis. Employing a descriptive survey design, the study involved a sample of 170 respondents from the university's library community. Data were gathered using a

structured questionnaire that focused on the extent of QR code usage for information retrieval. Mean and standard deviation were used to analyze the research questions, while the t-test statistic was applied to evaluate the null hypothesis at a 0.05 significance level. The findings revealed that QR codes are actively utilized for information retrieval in the academic libraries at the University of Nigeria, Nsukka, indicating a positive trend in their adoption among library users.

Roles of QR Codes in Enhancing Information Retrieval in Academic Libraries

QR codes have taken on significant roles in academic libraries, greatly enhancing the ease and efficiency of information retrieval for students, faculty, and researchers. These scannable codes act as direct gateways to digital content, allowing users to access a wealth of resources instantly without navigating through complex search processes (Madueke, 2020). For example, libraries can incorporate QR codes within their bookshelves, linking each code to digital catalogs, e-books, or specific journal articles that correspond to the subject matter in that area. This allows students to transition seamlessly from physical resources to digital ones, enhancing their learning experience. QR codes also provide access to tutorials, research guides, or instructional videos that may help students navigate specialized databases. This capability transforms the traditional library setup by incorporating interactive elements that help users locate relevant materials quickly and independently, promoting self-guided research and efficient information retrieval (Gambari, 2022).

Furthermore, QR codes in academic libraries can create a more personalized learning environment by providing customized information based on location within the library or user needs. Libraries can, for instance, create distinct QR codes for each academic department or subject, allowing students to scan a code and access curated reading lists, faculty recommendations, or department-specific updates (Hadiza, 2021). In doing so, QR codes facilitate targeted information retrieval that aligns with students' specific academic pursuits, thus reducing the time and effort spent on locating relevant materials. Additionally, libraries can utilize QR codes to keep resources current, as these codes can easily be updated to link to the latest articles, publications, or newly acquired resources. By updating the digital content linked to QR codes, libraries maintain a dynamic, up-to-date information network without needing to physically replace materials, making the information retrieval process both sustainable and highly adaptable (Chidalu, 2023).

The use of QR codes also supports outreach and engagement by linking library patrons to various library services and events. Libraries can place QR codes on bulletin boards, posters, and within study spaces, directing students to resources on upcoming workshops, study sessions, or library-hosted events. This not only informs students about available services but also enhances the library's role as an interactive learning hub (Sambo, 2020). QR codes can connect students with library assistance services, such as online chat support, reservation systems, and study room bookings, thus fostering a more supportive and accessible library environment. For remote learners or students who may

not have the opportunity to physically visit the library, QR codes provide a direct line to critical resources and support systems, bridging the gap between physical and digital library spaces. Ultimately, QR codes serve as versatile tools in academic libraries, transforming traditional library functions into user-centered, technology-driven experiences that enhance information retrieval in meaningful and innovative ways (Jibrin, 2020).

Strategies to Improve the Integration and Use of QR Codes for Information Retrieval in Academic Libraries

The integration of QR codes in academic libraries in Nigeria offers a significant opportunity to enhance information retrieval and improve user experience. One of the foremost strategies is to conduct extensive training and awareness programs for both library staff and users. By equipping librarians with the necessary skills to create and manage QR codes, libraries can ensure that these codes are effectively integrated into their existing information systems (Tanko, 2022). Workshops, seminars, and online courses can be organized to teach staff how to generate QR codes that link to library resources, databases, and instructional materials. Additionally, creating user-friendly guides and informational materials about how to scan QR codes and access resources can empower library patrons to utilize this technology confidently. With increased familiarity,

both librarians and users will likely engage more with QR codes, thereby enhancing their overall experience in accessing library services (Yekini, 2020).

Another critical strategy involves integrating QR codes into the library's physical environment and digital platforms. QR codes can be strategically placed on library signage, promotional materials, and bookshelves, providing immediate access to information about resources, services, and events (Udoma, 2023). For instance, QR codes can link to digital catalog entries, making it easier for users to find and borrow books. Moreover, embedding QR codes in library websites and digital newsletters can direct users to relevant online resources, such as e-books, journals, and multimedia content. This omnipresence of QR codes ensures that users encounter them at various points of engagement with the library, thereby increasing the likelihood of their use. It is essential for libraries to collaborate with IT departments to ensure that the codes lead to reliable, up-to-date information and that the scanning process is seamless across different mobile devices (Ukeje, 2020).

To further bolster the effectiveness of QR code integration, academic libraries in Nigeria can leverage partnerships with technology providers and educational institutions. Collaborating with tech companies can help libraries stay abreast of the latest advancements in QR code technology, including analytics tools that track usage patterns and user engagement (Binani, 2023). By analyzing this data, libraries can tailor their resources and services to meet the specific needs of their users. Additionally, partnerships

with universities and research institutions can facilitate research initiatives focused on evaluating the impact of QR code usage in information retrieval. Such collaborations can lead to innovative solutions and best practices that can be shared across the academic community, fostering a culture of continuous improvement in library services (Fagbemi, 2021).

Ongoing evaluation and feedback mechanisms are vital for ensuring the successful integration of QR codes in academic libraries. Establishing a system for collecting user feedback on QR code experiences can help libraries identify challenges and areas for improvement. This could involve surveys, focus group discussions, or suggestion boxes located in the library (Nnamani, 2020). Libraries should also regularly assess the effectiveness of QR codes in enhancing information retrieval through usage statistics and user behavior analysis. By continuously refining their approach based on user input and data-driven insights, libraries can adapt to changing user needs and technological advancements. This iterative process not only improves the integration of QR codes but also enhances the overall quality of library services, ultimately fostering a more user-centric approach in academic libraries across Nigeria (Salau, 2022).

Dieberuo (2022) conducted a study to identify strategies for enhancing the integration and use of QR codes for information retrieval in academic libraries in Delta State University, Abraka. The researcher aimed to explore effective approaches that could facilitate better access to library resources through QR codes. The study was

guided by four research questions and one null hypothesis. Utilizing a descriptive survey design, the research involved a sample of 120 respondents from the library's user community. Data were collected using a structured questionnaire focused on strategies for improving QR code integration. Mean and standard deviation were employed to analyze the research questions, while the t-test statistic was used to test the null hypothesis at a 0.05 significance level. The findings indicated several key strategies, including increased user training, awareness campaigns, and the enhancement of QR code visibility, to improve the integration of QR codes in the academic libraries of Delta State University, Abraka.

Ibhagui (2023) explored strategies to enhance the utilization of QR codes for information retrieval in academic libraries at Covenant University. The researcher aimed to identify effective methods to encourage library users to leverage QR codes for better access to information resources. The study was guided by five research questions and a null hypothesis. A descriptive survey design was adopted, with a sample of 150 respondents drawn from the library's user base. Data were collected using a structured questionnaire focusing on strategies for improving QR code utilization. The research questions were analyzed using mean and standard deviation, while the t-test was utilized to test the null hypothesis at a 0.05 significance level. Results revealed that strategies such as staff training, developing user-friendly QR code applications, and promoting QR code literacy among users could significantly enhance the use of QR codes for information retrieval at Covenant University.

Nwokolo (2022) conducted research to investigate strategies for improving the integration and use of QR codes for information retrieval in academic libraries in Lagos State University. The study aimed to explore various approaches that could enhance user engagement with QR codes in accessing library resources. Guided by three research questions and a null hypothesis, the study employed a descriptive survey design involving 180 respondents from the university's library community. Data were collected using a structured questionnaire that focused on strategies for QR code integration. Mean and standard deviation analyses were performed for the research questions, while the t-test statistic was applied to evaluate the null hypothesis at a 0.05 significance level. The findings highlighted several effective strategies, including the implementation of user education programs, increased promotional activities, and the optimization of QR code placement within library spaces to improve their utilization for information retrieval at Lagos State University.

Review of Empirical Studies

Several studies has been carried out by scholars on the effectiveness of QR codes in enhancing information retrieval in academic libraries. Zubairu (2021) conducted a study investigating the roles of QR codes in enhancing information retrieval in academic libraries in Ahmadu Bello University, Zaria. The study aimed to determine how QR codes could facilitate access to library resources among users. Four research questions guided the investigation, which utilized a descriptive survey design with a sample of 120 respondents. Data were collected through a structured questionnaire that focused on the

roles of QR codes in enhancing information retrieval. Mean and standard deviation were used to analyze the research questions, while the t-test was employed to test the null hypothesis at a 0.05 significance level. The findings revealed that QR codes significantly improve the efficiency of information retrieval in the academic libraries of Ahmadu Bello University.

Ibrahim (2022) examined the roles of QR codes in enhancing information retrieval in academic libraries at Obafemi Awolowo University, Ile-Ife. The researcher aimed to explore the effectiveness of QR codes in promoting access to library services and resources. The study was guided by five research questions and one null hypothesis. A descriptive survey design was used, with a sample size of 150 respondents selected from the library's user base. Data were gathered using a structured questionnaire focusing on QR codes' roles in enhancing information retrieval. The analysis involved calculating mean and standard deviation for the research questions, with a t-test statistic to test the null hypothesis at a 0.05 level of significance. Results indicated a positive correlation between the use of QR codes and improved information retrieval in the academic libraries of Obafemi Awolowo University.

Ezenagu (2023) conducted research exploring the roles of QR codes in enhancing information retrieval in academic libraries in University of Lagos. The study sought to assess the impact of QR codes on students' ability to access information efficiently. It was guided by three research questions and a null hypothesis. Using a descriptive survey

design, the study involved 200 respondents selected from the university's library. Data were collected through a structured questionnaire focusing on the roles of QR codes in enhancing information retrieval. The results were analyzed using mean and standard deviation for the research questions, with the t-test used to assess the null hypothesis at a 0.05 significance level. The study found that QR codes significantly enhance information retrieval among users of the University of Lagos academic library.

Aramu (2020) conducted a study examining the roles of QR codes in enhancing information retrieval in academic libraries at the University of Jos. The research aimed to evaluate how QR codes could facilitate users' access to digital resources within the library. Four research questions and a null hypothesis guided the study, which employed a descriptive survey design. A sample of 130 respondents was selected from the library's user base. Data collection was carried out using a structured questionnaire that focused on the use of QR codes in improving information retrieval. The analysis utilized mean, standard deviation, and t-test to assess the data, with a significance level set at 0.05. The study revealed that QR codes play a significant role in enhancing users' ability to retrieve information more efficiently in the University of Jos library.

Adebayo (2021) investigated the impact of QR codes on information retrieval in academic libraries at the University of Benin. The study aimed to determine how QR codes could improve access to library materials and services. It was guided by four research questions and one null hypothesis. The research used a descriptive survey design,

with a sample of 140 respondents drawn from the university library. Data were collected using a structured questionnaire that explored the role of QR codes in facilitating information retrieval. Mean and standard deviation were used to analyze the responses, and the t-test was employed to test the hypothesis at a 0.05 significance level. The findings indicated that QR codes had a significant positive impact on the efficiency of information retrieval in the academic library of the University of Benin.

Chukwudi (2023) conducted a study to explore the effectiveness of QR codes in enhancing information retrieval in academic libraries at the University of Abuja. The study aimed to assess how the integration of QR codes could enhance access to library resources and services. The study was guided by five research questions and a null hypothesis. Using a descriptive survey design, the researcher selected 160 respondents from the university's library users. A structured questionnaire was used for data collection, with a focus on QR codes' roles in enhancing information retrieval. The data were analyzed using mean, standard deviation, and t-test at a 0.05 significance level. The results revealed that the use of QR codes significantly improved the ease of information retrieval in the University of Abuja academic library.

Summary of Literature Reviewed

The literature reviewed critically examined the concepts of QR codes, academic libraries and information retrieval. As seen from the reviewed of literature, QR (Quick Response) code is a type of two-dimensional barcode that stores information in a matrix

of black and white squares, which can be read by a QR scanner or any smartphone camera. Academic libraries are libraries that are associated with higher education institutions, such as universities, colleges, and research institutes. Information retrieval on the other hand refers to the process of obtaining relevant information from a large collection of resources, typically in digital format.

The literature reviewed also examined level of awareness and extent QR codes are used for information retrieval in academic libraries. The reviewed of empirical studies shows a mixed results. While the level of awareness and extent of the usage of QR codes for information retrieval in some academic libraries are high, the reverse is the case in others.

The literature reviewed further examined roles of QR codes in enhancing information retrieval in academic libraries. It could be seen from the reviewed of related literature that by embedding QR codes into books, journals, and other physical library materials, students can quickly access supplementary content such as e-books, research databases, and academic papers without needing to manually search for these resources.

The literature reviewed was concluded with an examination on strategies to improve the integration and use of QR codes for information retrieval in academic libraries. Some of the strategies to improve the integration and use of QR codes for information retrieval in academic libraries as seen from the reviewed of literature include extensive training and awareness programme on the use of QR codes for both library staff

and users, integrating QR codes into the library's physical environment and digital platforms, partnerships with technology providers and educational institutions.

CHAPTER THREE

METHODOLOGY

In this chapter, the research methodology adopted for the study is explained under the following sub-headings: research design, population of the study, sample and sampling technique, research instrument, validity of the instrument, reliability of the instrument, method of data collection, method of data analysis.

Research Design

The research design adopted for this study was the descriptive survey research design. This design was particularly suitable for studies aimed at providing an in-depth understanding of the current state, behaviors, attitudes, or characteristics of a specific group or phenomenon. It involved systematically collecting, analyzing, and interpreting

data from a representative sample to identify trends, patterns, and relationships. The design was considered suitable because it allowed the researcher to effectively probe into the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of the University of Benin.

Population of Study

The population of the study comprised professional and paraprofessional staff in John Harris Library, University of Benin, Benin City. Available data showed that there were 100 professional and paraprofessional staff in John Harris Library, University of Benin, Benin City. This is shown in the table below.

Table 1: Population of Staffs in John Harris Library

S/N	Categories	Frequency
1.	Professional	13
2.	Paraprofessional	87
	Total	**100**

(Source: John Harris Library, UNIBEN, 2024)

Sample and Sampling Technique

All the 100 professional and paraprofessional staff in John Harris Library, University of Benin, Benin City were included. This comprised 13 professionals and 87 paraprofessionals. The researcher made use of census sampling. Census sampling referred to the process of systematically collecting data from every individual or unit in a

given population. This sampling method was adopted because the population was not large.

Research Instrument

The instrument that was used for data collection was a structured questionnaire developed by the researcher, titled: "Effectiveness of QR Codes in Enhancing Information Retrieval in Academic Libraries Questionnaire (EQRCEIRALQ)." The questionnaire was divided into two sections, A and B. Section A focused on the demographic or personal data of the respondents, while Section B contained information related to the problem of this research. The questionnaire consisted of a 4-point Likert scale response: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Validity of Instrument

The questionnaire designed by the researcher was presented to the project supervisor to cross-check for content validity. The supervisor's opinions and observations were incorporated into the instrument before it was administered to the respondents.

Reliability of Instrument

The test re-test method was used to determine the reliability of the instrument. The questionnaire was administered to a group of 20 respondents which did not constitute part of the study. The instruments were given to the students to fill and the data obtained

were analyzed using Pearson's Product Moment Correlation Coefficient. A reliability coefficient of 0.89 was obtained, indicating that the instrument is reliable for the study.

Method of Data Collection

The copies of the questionnaire were distributed by the researcher to the respondents. All the questionnaires that were administered were collected on the spot to ensure a high return rate.

Method Data Analysis

In analyzing the data, the researcher made use of frequency count and simple percentage to compute the findings from the research.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION OF RESULTS AND DISCUSSION OF FINDINGS

This chapter presented, analyzed and discussed the data that were collected for the study. The presentation and the analysis of data have been done under the following sub-headings:

- Questionnaire Response Rate
- Analysis of Respondents Bio-Data
- Answering of the Research Questions
- Discussion of Findings

QUESTIONNAIRE RESPONSE RATE

Table 1: Questionnaire Response Rate

Number of Questionnaire Administered	Number of Questionnaire Returned	Percentage of Questionnaire Returned
100	**100**	**100%**

Source: Researcher's Fieldwork, 2025

A total of 100 copies of the questionnaire were distributed and retrieved from the respondents which indicated a 100% response rate because the researcher waited to collect the filled questionnaire on the spot from the respondents.

ANALYSIS OF RESPONDENTS BIO-DATA

Table 2: Distribution of Respondents by Sex

Sex	**Frequency**	**Percentages**
Male	41	41%
Female	59	59%
Total	**100**	**100%**

Source: Researcher's Fieldwork, 2025

Table 2 revealed the distribution of the respondents according to sex. As seen in the table above, male respondents constituted 41% while female respondents represented 59%. This indicates that majority of the respondents were females.

Table 3: Distribution of Respondents by Professional Cadre

Professional Cadre	Frequency	Percentages
Professional	13	13%
Paraprofessional	87	87%
Total	**100**	**100%**

Source: Researcher's Fieldwork, 2025

The table shows the distribution of respondents by professional cadre, with 13% identified as professionals and 87% as paraprofessionals. This indicates that majority of the respondents are paraprofessionals.

ANSWERING OF THE RESEARCH QUESTIONS

Research Question 1: What is the level of awareness of the use of QR codes in academic libraries in University of Benin?

Table 1: Distribution of Responses on Level of Awareness of the use of QR Codes in Academic Libraries in University of Benin

S/N	Items	Total No of respondents	Agree	%	Disagree	%	Remarks
1.	The library often place QR codes on books, journals, and multimedia materials	100	96	96	4	4	High

2.	The library frequently use QR codes on library posters, brochures, and catalog cards to link directly to e-books and databases	100	91	91	9	9	High
3.	The library often implement QR codes at library entrances for easy access to catalogs, floor maps, or library rules	100	93	93	7	7	High
4.	The library frequently install QR codes in study areas to provide instant access to instructional videos and research guides	100	88	88	12	12	High
5.	The library frequently display QR codes to gather user feedback or conduct surveys on library services	100	95	95	5	5	High

The data in Table 1 highlights respondents' awareness of the use of QR codes in academic libraries at the University of Benin. For item 1, it can be observed that 96% of respondents agreed that the library often places QR codes on books, journals, and multimedia materials, indicating a high level of awareness about this practice, while only 4% disagreed. Item 2 reveals that 91% concurred that QR codes are frequently used on library posters, brochures, and catalog cards to link users directly to e-books and databases, further supporting the library's proactive approach in leveraging technology. Similarly, item 3 shows that 93% of respondents agreed that QR codes are implemented at library entrances for convenient access to catalogs, floor maps, or library rules, reflecting a strategic effort to enhance user experience. In item 4, 88% agreed that QR codes are installed in study areas to provide instant access to instructional videos and

research guides, signifying a slightly lower but still high level of awareness. Finally, item 5 demonstrates that 95% of respondents acknowledged the frequent use of QR codes to gather user feedback or conduct surveys on library services, showcasing the library's commitment to improving services through user engagement. Overall, these responses indicate a high level of awareness among respondents regarding the innovative use of QR codes in the University of Benin's academic libraries.

Research Question 2: To what extent are QR codes used for information retrieval in academic libraries in University of Benin?

Table 2: Distribution of Responses on Extent QR Codes are Used for Information Retrieval in Academic Libraries in University of Benin

S/N	Items	Total No of respondents	Agree	%	Disagree	%	Remarks
1.	The library often labeled books and shelves with QR codes that link directly to their catalog entries	100	92	92	8	8	High

2.	QR codes are placed in strategic locations within the library, linking users to popular online journals	100	97	97	3	3	High
3.	The library often link QR codes to interactive library maps to help users locate specific sections, rooms, or resources within the library	100	86	86	14	14	High
4.	The library uses QR codes for surveys or collecting user feedback	100	91	91	9	9	High
5.	The library often make use of QR codes on posters or screens to promote library events, workshops, or new arrivals in collections	100	83	83	17	17	High

The data in Table 2 illustrates the extent to which QR codes are utilized for information retrieval in the academic libraries at the University of Benin. For item 1, it is evident that 92% of respondents agreed that the library often labels books and shelves with QR codes linking directly to catalog entries, reflecting a high level of utilization, while only 8% disagreed. Item 2 shows the highest level of agreement, with 97% acknowledging the placement of QR codes in strategic locations within the library to provide access to popular online journals, indicating the library's effectiveness in integrating technology into its services. Item 3 reveals that 86% agreed that QR codes are linked to interactive library maps, helping users locate specific sections, rooms, or resources, although 14% expressed dissent, suggesting a slightly lower level of implementation compared to other

areas. Similarly, item 4 demonstrates that 91% of respondents agreed on the library's use of QR codes for surveys or collecting user feedback, underlining its role in engaging users and improving services. Lastly, item 5 shows that 83% agreed that QR codes are used on posters or screens to promote library events, workshops, or new arrivals, with 17% disagreeing, indicating a slightly less pervasive use in this area.

The analysis of data in the above table therefore implies that there is high extent to which QR codes are being used for information retrieval in academic libraries in University of Benin, Benin City.

Research Question 3: What are the roles of QR codes in enhancing information retrieval in academic libraries in University of Benin?

Table 3: Distribution of Responses on Roles of QR Codes in Enhancing Information Retrieval in Academic Libraries in University of Benin

S/N	Items	Total No of respondents	Agree	%	Disagree	%	Remarks

1.	QR codes can link directly to library databases, providing users with instant access to a wide array of academic articles	100	87	87	13	13	Agreed
2.	QR codes placed on posters, pamphlets, or promotional materials can direct users to information on library services and opening hours	100	91	91	9	9	Agreed
3.	QR codes can be posted around the library to guide users to specific sections, rooms, or resources	100	82	82	18	18	Agreed
4.	Libraries can use QR codes to provide access to online learning platforms, e-books, video tutorials, and other educational resources	100	94	94	6	6	Agreed
5.	By scanning QR codes, users can quickly access the library's online catalog from their mobile devices	100	98	98	2	2	Agreed

The data in Table 3 highlights the roles of QR codes in enhancing information retrieval in the academic libraries at the University of Benin. For item 1, 87% of respondents agreed that QR codes can link directly to library databases, providing instant access to a wide array of academic articles, while 13% disagreed, signifying strong acknowledgment of this role. Item 2 reveals that 91% of respondents concurred that QR codes on posters, pamphlets, or promotional materials effectively direct users to information on library

services and opening hours, further emphasizing their utility in user engagement. In item 3, 82% agreed that QR codes posted around the library guide users to specific sections, rooms, or resources, though 18% disagreed, indicating a slightly lower recognition of this role compared to others. Item 4 demonstrates that 94% of respondents acknowledged the use of QR codes for accessing online learning platforms, e-books, video tutorials, and other educational resources, reflecting their significant contribution to information retrieval. Lastly, item 5 shows the highest agreement, with 98% recognizing that scanning QR codes enables users to quickly access the library's online catalog from mobile devices, underscoring their convenience and efficiency.

The analysis of data in the above table therefore implies that QR codes play a pivotal role in enhancing information retrieval in academic libraries in University of Benin by improving access, navigation, and user interaction within the library system.

Research Question 4: What strategies can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin?

Table 4: Distribution of Responses on Strategies to Improve the Integration and Use of QR Codes for Information Retrieval in Academic Libraries

S/N	Items	Total No of respondents	Agree	%	Disagree	%	Remarks

1.	Staff training constitute a strategy to improve the integration and use of QR codes for information retrieval in academic libraries	100	92	92	8	8	Agreed
2.	Awareness campaign on QR codes usage can enhance their integration and use for information retrieval in academic libraries	100	81	81	19	19	Agreed
3.	Strategic placement of QR codes can help improve the integration and use of QR codes for information retrieval in academic libraries	100	97	97	3	3	Agreed
4.	Regular update of QR code links can help improve the integration and use of QR codes for information retrieval in academic libraries	100	88	88	12	12	Agreed
5.	Integrating QR codes into library resources can enhance their use for information retrieval in academic libraries	100	91	91	9	9	Agreed

The data in Table 4 outlines strategies to improve the integration and use of QR codes for information retrieval in academic libraries at the University of Benin. For item 1, 92% of respondents agreed that staff training is a key strategy to enhance the integration and use of QR codes, with only 8% disagreeing, indicating a strong consensus on the importance

of capacity building. Item 2 shows that 81% of respondents acknowledged that awareness campaigns on QR code usage can significantly enhance their integration and use, though 19% disagreed, reflecting a need for broader sensitization efforts. Item 3 received the highest level of agreement, with 97% affirming that the strategic placement of QR codes can improve their integration and effectiveness, while only 3% disagreed, underscoring its critical role. In item 4, 88% agreed that regularly updating QR code links can enhance their usability and relevance, while 12% disagreed, suggesting that this practice is recognized but could be more widely emphasized. Lastly, item 5 reveals that 91% of respondents agreed that integrating QR codes into library resources is essential for improving their use in information retrieval, with only 9% disagreeing.

The analysis of data in the above table therefore implies that some of the strategies that can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin include staff training, awareness campaign on QR codes usage, Strategic placement of QR codes, regular update of QR code links and integrating QR codes into library resources.

DISCUSSION OF FINDINGS

Findings from the study in research question one revealed that there is high level of awareness of the use of QR codes in academic libraries in University of Benin, Benin

City. This findings is in line with Nwankwo (2022) who found out in his study that there is high level of awareness of the use of QR codes in academic libraries.

Findings from the study in research question two shows that there is high extent to which extent are QR codes are being used for information retrieval in academic libraries in University of Benin. This findings is in agreement with Bamidele (2023) who found out in his study that there is high significant level of usage of QR codes for information retrieval in academic libraries.

Findings from the study in research question three indicated that QR codes play a pivotal role in enhancing information retrieval in academic libraries in University of Benin by improving access, navigation, and user interaction within the library system. In support of the findings, Madueke (2020) opined that QR codes have taken on significant roles in academic libraries, greatly enhancing the ease and efficiency of information retrieval for students, faculty, and researchers. In same vein, Hadiza (2021) found out that QR codes in academic libraries can create a more personalized learning environment by providing customized information based on location within the library or user needs.

Findings from the study in research question four shows that some of the strategies that can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin include staff training, awareness campaign on QR codes usage, Strategic placement of QR codes, regular update of QR code links and integrating QR codes into library resources. This findings is

in consonance with Tanko (2022) who asserted that by equipping librarians with the necessary skills to create and manage QR codes, libraries can ensure that these codes are effectively integrated into their existing information systems. Similarly, Udoma (2023) opined that QR codes can be strategically placed on library signage, promotional materials, and bookshelves, providing immediate access to information about resources, services, and events.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents a summary of the study, the conclusions derived, the results obtained, and the recommendations proposed.

Summary

The study investigated the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin. To achieve the purpose of the study, four research questions were raised and answered. The sample size for the study was made up of 100 professional and paraprofessional staff in John Harris Library, University of Benin, Benin City. This is made up of 13 professionals and 87 paraprofessionals.

The instrument that was used for the data collection is a structured questionnaire titled "Effectiveness of QR Codes in Enhancing Information Retrieval in Academic Libraries Questionnaire (EQRCEIRALQ)". The constructed questionnaire for the study was presented to the project supervisor and two other experts to confirm for content validity. Necessary corrections were made and after which it was re-written before it was administered by the researcher. The questionnaire was the instrument for data collection. The descriptive survey research design was employed for the study. For data analysis, frequency counts and percentages were used to calculate the research findings.

Findings of the research

Findings from the study include:

- That that there is high level of awareness of the use of QR codes in academic libraries in University of Benin, Benin City.
- That there is high extent to which extent are QR codes are being used for information retrieval in academic libraries in University of Benin.
- That QR codes play a pivotal role in enhancing information retrieval in academic libraries in University of Benin by improving access, navigation, and user interaction within the library system.
- That strategies that can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin include staff training, awareness campaign on QR codes usage, Strategic placement of QR codes, regular update of QR code links and integrating QR codes into library resources.

Conclusion

The study investigated the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin. Based on the findings of the study, the researcher concluded that QR codes play a pivotal role in enhancing information retrieval in academic libraries in University of Benin by improving access, navigation, and user interaction within the library system. It was also concluded that strategies that can be adopted to improve the integration and use of QR codes for information retrieval in academic libraries in University of Benin include staff training,

awareness campaign on QR codes usage, Strategic placement of QR codes, regular update of QR code links and integrating QR codes into library resources.

Recommendations

Based on the findings and conclusion drawn, the following recommendations were put forward:

1. The University of Benin school management should conduct periodic training sessions for library staff to enhance their proficiency in creating, managing, and troubleshooting QR codes. This will ensure seamless support for users and improve the overall effectiveness of QR code integration.
2. Academic libraries in the University of Benin should carry out an awareness campaigns aimed at educating library users on the benefits and functionalities of QR codes in accessing library resources. These campaigns can include workshops, social media outreach, and instructional materials to encourage widespread adoption.
3. Academic libraries in the University of Benin should ensure that QR codes are strategically placed in highly visible and relevant locations within the library, such as near book shelves, study areas, and catalog terminals. This will make it easier for users to access specific resources quickly.

4. Academic libraries in the University of Benin should establish a system for periodically reviewing and updating QR code links to ensure they remain functional and lead to the most current and relevant information. This will help minimize user frustration and enhances trust in the system.

5. Efforts should be made to embed QR codes into various library resources, such as catalog entries, digital archives, and e-book sections. This will provide users with instant access to digital materials and supplementary resources, further streamlining the information retrieval process.

Limitations of the Study

The following limitation were encountered in the course of carrying out the research work:

1. Time Constraints: The limited timeframe for the study restricted the extent of data collection and analysis, potentially preventing an in-depth exploration of certain aspects of QR code usage in academic libraries.
2. Financial Limitations: Inadequate financial resources constrained the ability to access a broader range of library users, acquire additional research materials, and implement a more extensive data collection process.
3. Geographical Scope: The study was conducted solely within the University of Benin, which may limit the generalizability of the findings to other academic libraries with different infrastructures and user demographics.

4. Respondents' Reluctance: Some library users were hesitant to fully engage in the survey or provide comprehensive responses, which may have impacted the accuracy and reliability of the data collected.
5. Sample Size: The number of participants involved in the study was limited, which could affect the representativeness of the findings and restrict their applicability to a wider academic library setting.

Suggestions for Further Studies

The researcher focused on the effectiveness of QR codes in enhancing information retrieval in academic libraries: A study of University of Benin. Similar research can be carried out in other academic libraries in other tertiary institutions across Nigeria for a better generalization of the study.

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UNIVERSITY OF BENIN

Dear Respondent,

The questionnaire is for the purpose of investigating the "**Effectiveness of QR Codes in Enhancing Information Retrieval in Academic Libraries: A Study of University of Benin**". Kindly fill it as appropriate. Your information will be treated confidentially. Thank you for your time.

Section A: Demographic Data

Gender: Male ( ) Female ( )

Status: Professional ( ) Paraprofessional

Section B: Data on Questionnaire

Indicate the extent to which you agree or disagree with the following statements.

Key: Strongly Agree (SA), Agree (A), Disagree (D), Strongly Disagree (SD)

S/N	ITEMS	SA	A	D	SD
	Level of Awareness of the use of QR Codes in Academic Libraries				
1.	The library often place QR codes on books, journals, and multimedia materials				
2.	The library frequently use QR codes on library posters, brochures, and catalog cards to link directly to e-books and databases				
3.	The library often implement QR codes at library entrances for easy access to catalogs, floor maps, or library rules				
4.	The library frequently install QR codes in study areas to provide instant access to instructional videos and research guides				
5.	The library frequently display QR codes to gather user feedback or conduct surveys on library services				
	Extent QR Codes are Used for Information Retrieval in Academic Libraries				

6.	The library often labeled books and shelves with QR codes that link directly to their catalog entries				
7.	QR codes are placed in strategic locations within the library, linking users to popular online journals				
8.	The library often link QR codes to interactive library maps to help users locate specific sections, rooms, or resources within the library				
9.	The library uses QR codes for surveys or collecting user feedback				
10.	The library often make use of QR codes on posters or screens to promote library events, workshops, or new arrivals in collections				
	Roles of QR Codes in Enhancing Information Retrieval in Academic Libraries				
11.	QR codes can link directly to library databases, providing users with instant access to a wide array of academic articles				
12.	QR codes placed on posters, pamphlets, or promotional materials can direct users to information on library services and opening hours				
13.	QR codes can be posted around the library to guide users to specific sections, rooms, or resources				
14.	Libraries can use QR codes to provide access to online learning platforms, e-books, video tutorials, and other educational resources				
15.	By scanning QR codes, users can quickly access the library's online catalog from their mobile devices				
	Strategies to Improve the Integration and Use of QR Codes for Information Retrieval in Academic Libraries				
16.	Staff training constitute a strategy to improve the integration and use of QR codes for information retrieval in academic libraries				
17.	Awareness campaign on QR codes usage can enhance their integration and use for information retrieval in academic libraries				
18.	Strategic placement of QR codes can help improve the integration and use of QR codes for information retrieval in academic libraries				

19.	Regular update of QR code links can help improve the integration and use of QR codes for information retrieval in academic libraries				
20.	Integrating QR codes into library resources can enhance their use for information retrieval in academic libraries				