Revolutionizing Agriculture Libraries in India:A Comprehensive Study on Implementing Near Field Communication (NFC) Technology for Enhanced Access and Knowledge Sharing

Abstract

This article delves into the potential impact of Near Field Communication (NFC) technology on addressing the challenges faced by agriculture libraries in India. It specifically focuses on issues such as limited accessibility, outdated infrastructure, and resource constraints. Recognizing the importance of modernization, the research proposes the use of NFC as a solution to enhance the functionality of these libraries. NFC enables seamless communication, allowing users to instantly access relevant information by simply tapping their NFC-enabled devices on tags or stickers. The study outlines its objectives, which include evaluating the needs of users, creating NFC-enabled resources, developing mobile applications that are user-friendly, providing training, and ensuring continuous monitoring. Results from a survey of 105 participants from various agricultural universities indicate positive perceptions, awareness of NFC, and a willingness to adopt this technology. The discussion highlights how integrating NFC aligns with the expectations of users, thereby paving the way for modernized and enhanced library experiences in the ever-evolving landscape of agricultural education and research in India.

Keyword :*Near Field Communication Technology(NFC), Agriculture Library, Electronic Data, Smart Library,Knowledge sharing.Modernization.*

INTRODUCTION :

With the advancement of technology, the agriculture sector in India is undergoing a transformation. The role of libraries in this industry cannot be underestimated, as they serve as valuable repositories of knowledge and resources. However, traditional libraries face challenges in terms of accessibility and knowledge sharing. This is where Near Field Communication (NFC) technology[10] comes into play.

In this article, we will explore the role of NFC in modernizing agriculture libraries in India. NFC allows for seamless communication and data exchange between devices in close proximity, without the need for an internet connection. By integrating NFC into agriculture libraries, students, scholars, faculties and other patrons can access information and resources more conveniently, regardless of their location.

Through NFC-enabled devices such as smartphones or tablets, users can simply tap on NFC tags or stickers placed on books, documents, or displays to instantly access relevant information[6]. This not only enhances access to knowledge but also promotes efficient information sharing among students, scholars, faculties, and other stakeholders in the agriculture sector.

This article explores the potential impact of NFC technology on agriculture libraries in India [12] and how it can revolutionize information dissemination and knowledge sharing in the industry.

IMPORTANCE OF ACCESS AND KNOWLEDGE SHARING IN AGRICULTURE LIBRARIES:

Agriculture libraries play a crucial role in providing students, scholars, facultiesand other stakeholders in the industry with access to valuable information and resources. These libraries serve as repositories of

knowledge, housing books, journals, research papers, and other relevant materials that can help improve agricultural practices and foster innovation.

However, traditional agriculture libraries face challenges in ensuring widespread access and efficient knowledge sharing. Geographical limitations, limited opening hours, and lack of resources can hinder students,scholars and facultiesfrom accessing the information they need in a timely manner. This can impede progress and hinder the adoption of best practices in the agriculture sector.

To address these challenges, it is essential to modernize agriculture libraries and leverage technology to enhance access and knowledge sharing [13]. Near Field Communication (NFC) technology provides a promising solution in this regard.

CHALLENGES FACED BY AGRICULTURE LIBRARIES IN INDIA:

In India, agriculture libraries face several challenges that hinder their effectiveness in disseminating information and promoting knowledge sharing. One of the main challenges is the limited physical accessibility of libraries, especially in rural areas. Students often have to travel long distances to reach the nearest library, which can be time-consuming and costly.

Furthermore, traditional libraries typically have limited opening hours, making it difficult for students,scholars and faculties with busy schedules to access the information they need.

Another challenge is the lack of resources and outdated infrastructure in many agriculture libraries. Limited funding often prevents libraries from acquiring new books, journals, and other relevant materials. Additionally, the lack of proper cataloging and indexing systems makes it difficult for users to find the information they need efficiently.

These challenges highlight the need for modernization and innovation in agriculture libraries to ensure widespread access and efficient knowledge sharing.

HOW NFC CAN MODERNIZE AGRICULTURE LIBRARIES:

Near Field Communication (NFC) [14] technology has the potential to revolutionize agriculture libraries by enhancing access to information and promoting efficient knowledge sharing. NFC allows for seamless communication and data exchange between devices in close proximity, without the need for an internet connection.

By integrating NFC into agriculture libraries, students, scholars, facultiesand other patrons can access information and resources more conveniently, regardless of their location[11]. NFC-enabled devices such as smartphones or tablets can be used to interact with NFC tags or stickers placed on books, documents, or displays. Users simply need to tap their devices on the NFC tags to instantly access relevant information[9].

Moreover, NFC facilitates efficient information sharing among stakeholders in the agriculture sector. Students can share their experiences and success stories by simply tapping their devices on NFC tags placed in designated areas within the library. This promotes peer-to-peer learning and the exchange of practical knowledge, fostering innovation and improving agricultural practices.

BENEFITS OF USING NFC IN AGRICULTURE LIBRARIES:

The integration of NFC technology in agriculture libraries offers several benefits that can significantly enhance access to information and knowledge sharing in the industry.

1.**Convenience and Accessibility:** NFC-enabled devices such as smartphones and tablets are widely available and easy to use. Users can access information anytime and anywhere by simply tapping their devices on NFC tags or stickers, eliminating the need for physical presence in the library[5].

2.**Real-time Updates:** NFC technology allows for real-time updates and push notifications. Libraries can use this feature to inform users about new arrivals, upcoming events, and relevant information, ensuring that users stay informed and up to date.

3.**Efficient Information Sharing:** NFC enables seamless sharing of information between users. Students and scholars can share their experiences, success stories, and best practices by tapping their devices on designated NFC tags within the library. This promotes collaboration, innovation, and the exchange of practical knowledge.

4.**Improved User Experience:** NFC technology enhances the overall user experience by providing quick and easy access to information. Users can retrieve relevant resources instantly, saving time and effort. The intuitive nature of NFC interactions also makes it user-friendly, even for individuals with limited technological expertise[8].

5.**Cost-effective Solution:** NFC technology is a cost-effective solution for agriculture libraries. Implementing NFC-enabled systems requires minimal infrastructure changes compared to other technologies. NFC tags and stickers are affordable and can be easily integrated into existing library materials and displays.

The benefits of using NFCin agriculture libraries are evident, and its implementation [15] can significantly enhance access to information and promote efficient knowledge sharing in the agriculture sector.

IMPLEMENTING NFC IN AGRICULTURE LIBRARIES

The implementation of NFC technology [3] in agriculture libraries requires careful planning and consideration. Here are some key steps to successfully integrate NFC into agriculture libraries:

1.**Assessing User Needs:** Understand the specific needs and requirements of the library users, including students, scholars, facultiesand other stakeholders. Conduct surveys and interviews to identify the information they seek and the challenges they face in accessing it [17].

2.**Creating NFC-enabled Resources:** Determine the library materials and displays that can benefit from NFC technology. Create NFC tags or stickers and attach them to books, documents, or displays to provide users with instant access to relevant information[7].

3.**Developing a Mobile Application:** Create a mobile application that supports NFC interactions. The application should be user-friendly and intuitive, allowing users to tap their devices on NFC tags to access information seamlessly[4].

4.**Training and Support:** Provide training and support to library staff and users to ensure they are familiar with NFC technology and its functionalities. This will facilitate a smooth transition to the new system and maximize its benefits [16].

5.**Monitoring and Evaluation:** Continuously monitor and evaluate the implementation of NFC technology in agriculture libraries. Gather feedback from users to identify areas for improvement and address any challenges or issues that may arise.

Successful implementation of NFC technology in agriculture libraries requires collaboration between library staff, technology experts, and stakeholders in the agriculture sector. By working together, they can

create a seamless and user-friendly system that enhances access to information and promotes efficient knowledge sharing.

LITERATURE REVIEW

The article, "Optimizing Library Book Borrowing with NFC Technology: A Case Study at XYZ University" by Rony Baskoro Lukito and Vilianty Rizki Utami, [2] explores the integration of Radio Frequency Identification (RFID) and Near Field Communication (NFC) technologies at XYZ University's library. The study addresses the challenges faced by traditional auto-borrow systems, emphasizing the prevalence of smartphones with NFC capability. The literature review underscores the advantages of library automation, RFID technology for streamlined book borrowing, and introduces NFC technology with its communication models and broader applications. The authors propose leveraging NFC on smartphones to facilitate data collection, empower users for independent borrowing, and reduce queues. The conclusion highlights the promising solution of NFC-enabled smartphones for book borrowing, reducing dependence on staff and machines, and preventing book loss. The recommendations suggest extending the system to other library collections and optimizing for diverse borrowing rules, providing insights into the future of efficient library management.

The development of an intelligent library and the various challenges it entails, such as monitoring, registration, security establishment, management, tagging, tracking, self-service, and user detection, have captured the attention and concern of scholars. In a seminal work, Nisha et al. (2007) [11] devised an Internet of Things (IoT) system for efficient library management, leveraging Near-field Communication (NFC) technology and embedded NFC tags on both books and user cards. By utilizing NFC readers, libraries can effectively control operations, while users can conveniently access comprehensive book information through their smartphones or a handheld reader, which can also be accessed on a desktop.

INTRODUCTION OF THE SURVEY

In the rapidly evolving landscape of agricultural education and research, the integration of cutting-edge technologies plays a pivotal role in enhancing user experiences and modernizing essential services. The study highlights the vital importance of agriculture libraries in the field of agriculture, serving as invaluable sources of knowledge for students, scholars, facultiesand others. These libraries play a crucial role in advancing agricultural practices and promoting innovation. However, traditional agriculture libraries face numerous obstacles, such as limited access, restricted hours, resource limitations, and outdated infrastructure, hindering the effective dissemination of information and the adoption of best practices.

The introduction of Near Field Communication (NFC) technology emerges as a transformative solution to address these challenges. NFC enables seamless communication and data exchange between devices, providing users with an efficient and accessible means to access information and share knowledge. The study emphasizes the potential benefits of integrating NFC technology into agriculture libraries, including improved convenience, real-time updates, efficient information sharing, enhanced user experiences, and a cost-effective approach. This represents a significant stride towards overcoming existing challenges and modernizing agricultural knowledge-sharing practices.

The problem addressed in the study is the inefficiency of traditional agriculture libraries in India, characterized by limited accessibility, outdated infrastructure, and challenges in knowledge-sharing. These issues hinder the effective utilization of library resources, impeding the progress and innovation in the agriculture sector.

While the study emphasizes the potential of NFC technology to address the challenges faced by agriculture libraries, it does not explicitly explore the potential drawbacks, limitations, or concerns associated with the implementation of NFC. Additionally, the study does not delve into the specific

technical requirements and considerations for integrating NFC into existing library systems. Understanding these aspects is crucial for a comprehensive evaluation of the feasibility and potential obstacles in adopting NFC technology in agriculture libraries. Further research may be needed to address these gaps and provide a more nuanced understanding of the practical implications of implementing NFC in the context of agriculture libraries in India.

Key Objectives of the Survey:

1. **Demographic Information:**Identify the types of users who frequent agriculture libraries.Determine the departments to which the respondents belong.

2. **Library Usage Patterns:**Examine the frequency of library visits among the participants.

3. **Awareness of NFC Technology**:Assess the respondents' familiarity with Near Field Communication (NFC) technology.

4. **Potential Applications of NFC in Libraries**:Identify the library services where respondents believe NFC technology could enhance user experiences.

5. **User Willingness to Adopt NFC Technology:**Evaluate the likelihood of respondents to embrace NFC technology for library services.

6. **Satisfaction with Current Library Services:**Gauge the overall satisfaction of respondents with the existing library services.

By addressing these objectives, the survey aims to provide valuable insights into the perceptions and expectations of users regarding the incorporation of NFC technology in agriculture libraries. The findings of this study will contribute to the ongoing discourse on the modernization of library services in the context of agricultural education and research in India.

Methodology: The survey involved 105 respondents from different universities. The Google Form questionnaire gathered comprehensive data on user demographics, library usage patterns, awareness of NFC technology, opinions on potential applications, willingness to adopt NFC, and satisfaction with existing library services. The collected data were analyzed quantitatively to identify patterns, correlations, and trends.

Participants:
The survey included 105 respondents different universities like G. B. Pant University of Agriculture and Technology (Pantnagar, Uttarakhand),Guru Angad Dev Veterinary And Animal Sciences University (Ludhiana),Khalsa College of Veterinary and Animal Sciences, (Amritsar),Punjab University (Chandigarh) , Rajasthan University of Veterinary and Animal Sciences (Bikaner, Rajasthan) including students, scholars, faculties and others. Participants were selected from different universities to ensure a broad representation of perspectives.

Survey Design:
The Google Form questionnaire was structured to gather comprehensive data. It encompassed questions related to user demographics (type and department), frequency of library visits, awareness of NFC technology, and opinions on potential applications of NFC in library services. Additionally, respondents were queried on their likelihood to adopt NFC technology for library services and were asked to rate their current satisfaction with existing library services.

Data Collection:
The survey was distributed electronically to participants, ensuring a wide reach and ease of response. Data collection took place over a specified period, allowing for a diverse pool of responses.

Data Analysis:
Quantitative data obtained from the survey responses were analyzed using statistical methods to identify patterns, correlations, and trends.

DATA REPRESENTATION

1.Division of Respondents as Per their designation

Table 1.Designation of the respondent

S.No	Designation	Number	Percentage
1	Student	87	82.9
2	Scholar	11	10.5
3	Other	5	4.8
4	Faculty	2	1.9

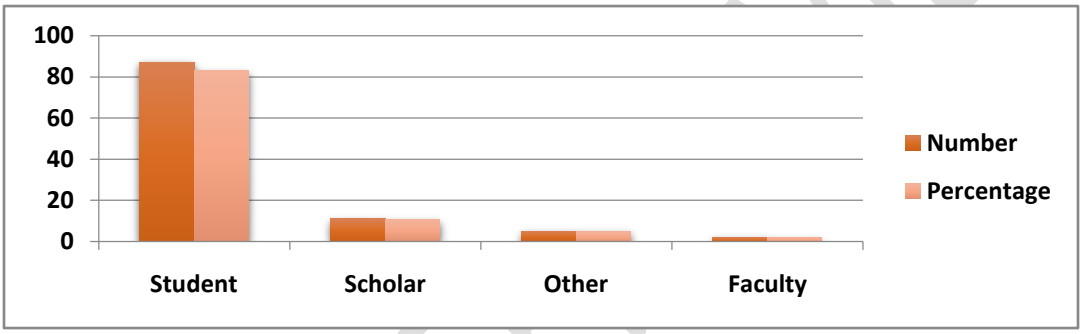

Figure. 1. Graphical presentation of the Designation of the Survey Participant

The majority of library visitors are students, constituting a substantial 82.9% of the respondents. Scholars follow with 10.5%, while other designations and faculty members make up smaller proportions, with percentages of 4.8% and 1.9%, respectively. This distribution provides insights into the user composition of the surveyed agriculture university libraries, highlighting the prominence of student engagement in these academic spaces.

2.Division of Respondents as Per their Department / Course

Table 2. Department / Course of the respondents

S.No	Department/Course	Number	Percentage
1	B.Sc	51	49
2	MVSc	25	24
3	M.Sc	21	20.2
4	PhD	5	4.8
5	MBA	2	1.9

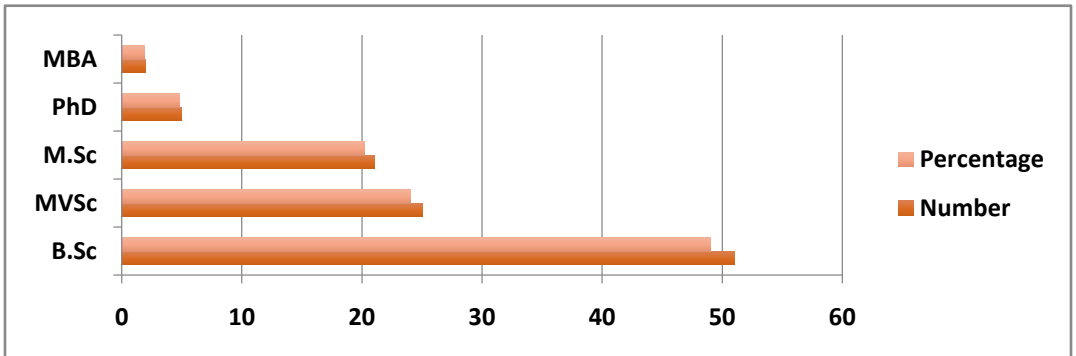

Figure. 2. Graphical presentation of Department & courses of the respondents

The B.Sc program has the highest affiliation among the respondents, accounting for 49% of the participants. Following closely are the MVSc and M.Sc programs, with 24% and 20.2% respectively, indicating a diverse representation of postgraduate students. The survey also involves Ph.D. candidates (4.8%) and a smaller percentage from the MBA program (1.9%). This distribution allows us to gain insights into the academic diversity of the respondents, highlighting the involvement of different departments and courses in the survey on NFC technology in agriculture libraries.

3. Division of Respondents Based on How Often They Visit the Library

Table 3. How often do you visit the library?

S.No	Frequency	Number	Percentage
1	Weekly	39	39
2	Monthly	25	23.8
3	Daily	20	19
4	Rarely	19	18.1

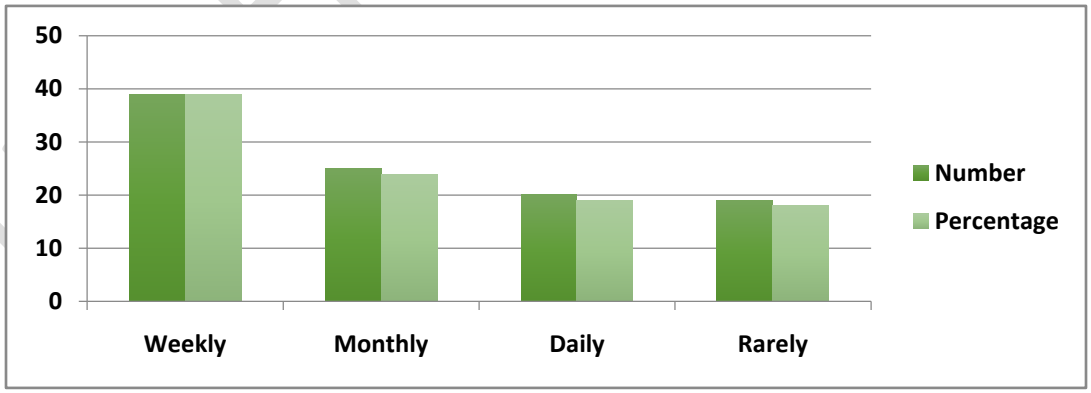

Figure. 3. Graphical presentation regarding of how often user visit library.

The library is visited on a weekly basis by the majority of respondents, making up 39% of the participants. The second most common pattern is monthly visits, with 23.8%, followed closely by daily visitors at 19%. A noteworthy percentage of respondents, totaling 18.1%, rarely visit the library. This distribution reveals

the varied usage habits of the individuals surveyed and offers valuable insights into how frequently they engage with the library in the context of agricultural education.

4. Division of Respondents Based on Are you familiar with NFC (Near Field Communication)?

Table 4. Are you familiar with NFC (Near Field Communication)?

S.No	Familiar with NFC	Number	Percentage
1	Yes	59	56.2
2	No	46	43.8

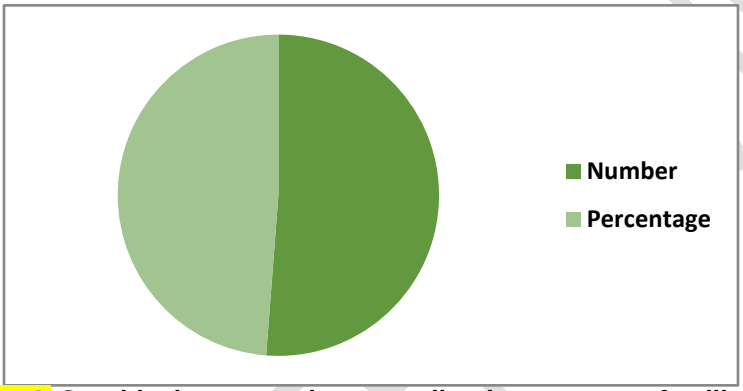

Figure. 4. Graphical presentation regarding how user are familiar with NFC.

The majority of respondents, 56.2%, are familiar with NFC technology. On the other hand, 43.8% of participants indicated that they were not familiar with NFC technology. These data provide valuable insights into the level of awareness and familiarity with NFC technology among the individuals surveyed, which is critical to understanding their readiness for the potential integration of NFC technology into agricultural libraries.

5. Division of Respondents Based on Are you familiar with NFC (Near Field Communication)?

Table 5.In which library services do you think NFC could enhance the user experience?

S.No	Optimize library services using NFC	Number	Percentage
1	Accessing digital resources	58	55.2
2	Smart space	20	19
3	Borrowing and returning books	19	18.1
4	Library navigation	7	6.7
5.	Event registration	1	1

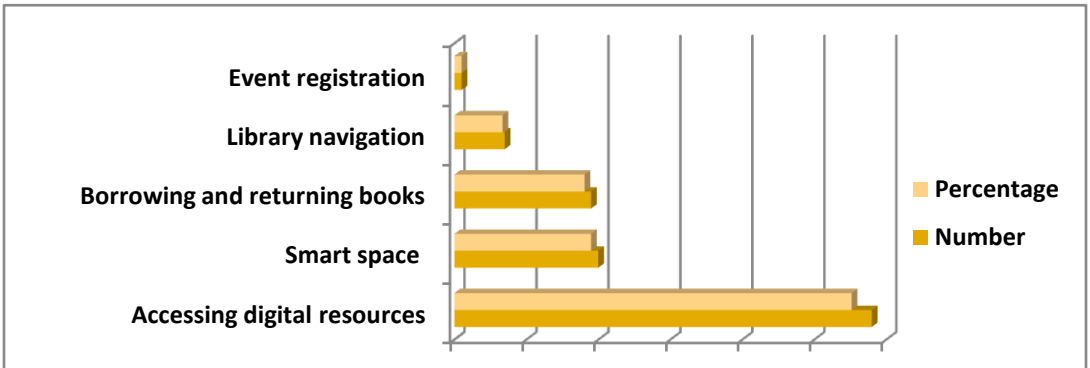

Figure. 5. **Graphical presentation regarding library services in which NFC could enhance user experience.**

The majority of survey participants, accounting for 55.2%, believe that NFC technology has the potential to greatly improve the user experience when accessing digital resources. A notable portion, 19%, sees possibilities in using NFC to create smart areas within the library. Furthermore, 18.1% of respondents believe that NFC could enhance the borrowing and returning of books. A smaller percentage, 6.7%, imagine NFC being used for library navigation, while only 1% think it could be used for event registration. This information provides valuable insights into what library users expect and prefer when it comes to incorporating NFC technology into various library services.

6. Division of Respondents Based on How likely are you to use NFC technology for library services?

Table 6. How likely are you to use NFC technology for library services?

S.No	Probability of NFC use for library services	Number	Percentage
1	Likely	40	38.1
2	Neutral	27	25.7
3	Very Likely	22	21
4	Unlikely	9	8.6
5	Very Unlikely	7	6.7

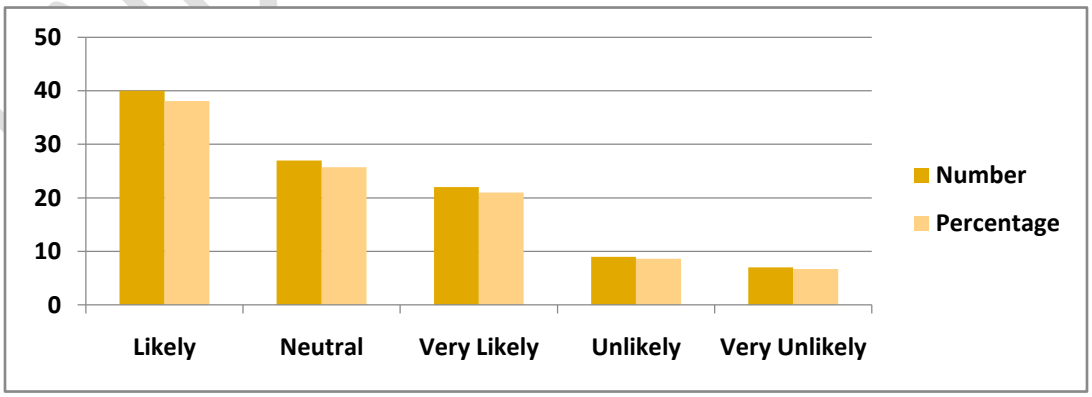

Figure. 6. **Graphical presentation regarding how user will use NFC for library services.**

Most of the people who answered the survey, about 38.1%, said they would probably use NFC technology for library services. A good amount, 25.7%, didn't really have a strong opinion either way. About 21% said they were very likely to use NFC. On the other hand, 8.6% said they probably wouldn't use it, and 6.7% said they definitely wouldn't use it. This information tells us how different people feel about using NFC in libraries.

7. Division of Respondents Based on Rate your current satisfaction with the library services

Table7. Rate your current satisfaction with the library services

S.No	Overall Satisfaction level	Number	Percentage
1	Satisfied	69	66.3
2	Very Satisfied	19	18.3
3	Neutral	14	13.5
4	Dissatisfied	1	1
5	Very Dissatisfied	1	1

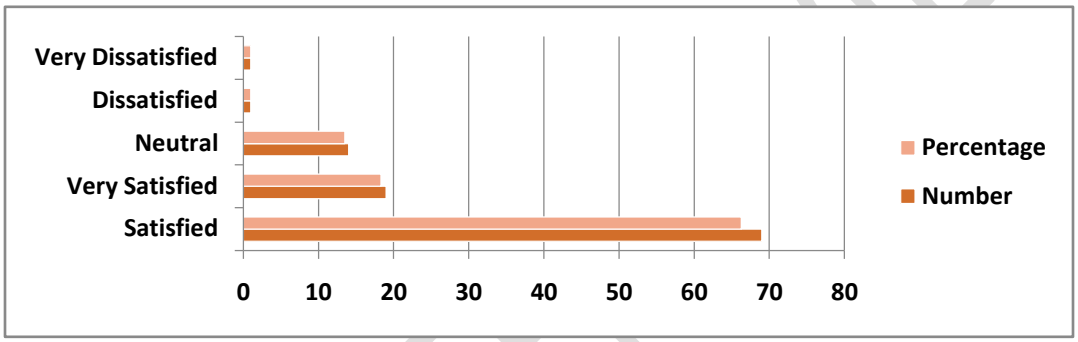

Figure. 7. Graphical presentation regarding overall current satisfaction with the library services.

The majority of respondents, representing 66.3%, express satisfaction with the current library services. Additionally, 18.3% report being very satisfied, while 13.5% hold a neutral stance. A small percentage, 1%, each expresses dissatisfaction and very dissatisfaction with the existing library services. This data provides insights into the overall contentment levels of users, serving as a valuable reference point for understanding the user experience and potential areas for improvement in library services.

The key objectives of the survey were designed to gather comprehensive insights into various aspects related to agriculture libraries and Near Field Communication (NFC) technology.

Its primary aim was to gather demographic data, discerning the profiles of individuals who visit agriculture libraries and identifying the specific departments they are affiliated with. This endeavor facilitated a nuanced comprehension of the library's user base, uncovering a notable prevalence of students, particularly those enrolled in the B.Sc program.

In exploring the second objective, the patterns of library utilization were investigated, specifically the frequency of visits among the participants. The survey findings unveiled a wide array of usage habits, with a notable majority visiting on a weekly basis. These invaluable insights shed light on the extent of users' interaction with the library within the realm of agricultural education.

In order to gauge the respondents' knowledge and familiarity with NFC technology, the third objective of this study aimed to assess their awareness and shed light on their readiness for its potential integration into agricultural libraries.

In the pursuit of its fourth goal, the study sought to unveil the myriad possibilities of integrating NFC technology in libraries. The focus predominantly rested on gauging participants' perceptions of where

NFC could truly elevate user experiences. Remarkably, the results underscored the considerable number of individuals who firmly believed in NFC's capacity to revolutionize digital resource accessibility for users.

The fifth objective centered around gauging user receptiveness towards implementing NFC technology, assessing the probability of respondents embracing this cutting-edge technology for library services. Findings revealed a significant portion of respondents displayed a strong inclination or high probability of utilizing NFC technology, thereby offering valuable insights into user perspectives on incorporating innovative technologies in library services.

The sixth objective sought to measure overall contentment with the existing library services, with a prevailing number of participants expressing contentment. This dataset serves as a priceless benchmark for comprehending the user experience and identifying prospective domains for enhancement in library services.

In essence, the survey objectives effectively encompassed demographic data, usage trends, awareness of NFC technology, perspectives on its potential applications, user inclination to embrace NFC, and overall contentment with current library services, offering a holistic comprehension of the surveyed population's viewpoints on agricultural libraries and NFC technology.

RESLUT AND DISCUSSION:

The survey's strength lies in its diverse representation, encompassing students, faculty, and staff from prominent agricultural universities. The prevalence of student engagement underscores the need for technology integration to align with user demographics. Users, particularly those familiar with NFC, demonstrated a keen interest in leveraging its capabilities for enhancing library services. The identified applications, including smart spaces and optimized resource access, offer actionable insights for future technological implementations. Furthermore, the high satisfaction levels with current library services provide a valuable baseline, offering a foundation for enhancing user experiences through NFC technology. This study bridges the gap between technological innovation and user expectations, shaping the discourse on the future of agriculture libraries in India.

CONCLUSION:

In conclusion, the survey on the integration of Near Field Communication (NFC) technology in agriculture libraries revealed significant insights into user perspectives and expectations. The majority of respondents, predominantly students, exhibited a notable awareness of NFC technology. Varied library usage patterns highlighted the need for tailored services. A positive inclination towards adopting NFC technology was evident, with users identifying potential applications, especially in accessing digital resources. The findings contribute substantively to ongoing discussions about the modernization of library services in the context of agricultural education in India.

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