

CENTRAL TREE BANK: EMPOWERING TREE CONSERVATION AND ENVIRONMENTAL MONITORING THROUGH A MOBILE APPLICATION

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Received 14.03.2024.
Revised 11.05.2024.
Accepted 18.07.2024.

Keywords:

Central Tree Banking (CTB) app, tree conservation, environmental empowerment, environmental awareness.

Original research



ABSTRACT

This study examined the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment. A mixed methods research design was utilized to achieve the objectives of assessing participants' awareness and knowledge, describing CTB app features, evaluating ease of use and effectiveness, and exploring participants' experiences during tree planting. Quantitative data were collected through survey interviews, revealing a high level of awareness and knowledge regarding conservation and environmental empowerment. However, some participants were not familiar with the law pertaining to environmental responsibilities. Thematic analysis of qualitative data from participants' experiences highlighted the convenience and usefulness of the CTB app for tree conservation. The study concluded that the CTB app, with its user-friendly interface and comprehensive functionalities, has the potential to contribute to environmental stewardship and empower individuals in their tree conservation efforts. Recommendations were made to enhance the app's usability and effectiveness based on user feedback.

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1. INTRODUCTION

Trees play a crucial role in mitigating the adverse effects of climate change and promoting environmental sustainability (World Risk Index 2022). The urgent need to plant and grow more trees in the Philippines is evident due to various factors (Bensel, 2008). Firstly, the Philippines ranks first globally in the World Risk Index 2022, highlighting the vulnerability of the country to natural disasters and climate-related risks (World Risk Index 2022) (Eckstein et al., 2021). Secondly, the Intergovernmental Panel on Climate Change (IPCC, 2013) predicts an increase in hot temperature extremes, emphasizing the importance of proactive measures to combat climate change (IPCC, 2013). Additionally, the Philippines has experienced rising temperatures, increased rainfall, and the need for immediate reductions in greenhouse gas emissions (DENR, n.d; Monsod et al., 2021).

Recognizing the significance of trees in combating climate change, the Central Tree Banking (CTB) mobile monitoring application was developed as a tool for tree conservation and environmental empowerment (Ivetić, 2020). This study focuses on analyzing the features and assessing the impact of the CTB App through a survey questionnaire. The research objectives include describing the features of the CTB App, evaluating its ease of use, effectiveness in planting and monitoring, and exploring participants' experiences during tree planting activities. To provide a broader context, the study acknowledges the existing laws in the Philippines that mandate tree planting (Von Kleist et al. 2021). For instance, the recently enacted R.A. 10176 requires all Filipinos aged 12 and above to plant at least one tree annually, while graduating students are required to plant ten trees as a prerequisite for graduation (DENR, n.d;) (Amul & Etter, 2024). However, enforcing compliance with these laws faces several challenges, including the absence of appropriate

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monitoring tools, limited availability of saplings, the need for inclusive mechanisms, and the absence of a reliable tree counting device (Stephenson et al., 2022).

The study aims to address these limitations by leveraging the CTB App. The Enhanced National Greening Program seeks to reforest 7.1 million hectares of unproductive, denuded, and degraded forestlands, which could potentially amount to 7.8 billion trees (DENR, n.d;). Furthermore, focusing on urban areas, the goal is to plant approximately 12 billion trees to achieve a greening target of 10% (DENR, n.d;). By utilizing the CTB App, the study aims to record and monitor tree planting accomplishments, milestones, and progress towards these targets (Semeraro et al., 2021).

The significance of the CTB App extends beyond compliance monitoring. It offers features such as GPS tracking, documentation, and evidence-based tree status monitoring, which can enhance tree survival rates and facilitate follow-up measures (Maheu et al., 2020). Furthermore, the CTB App aligns with international agreements and initiatives. The link between the Paris Agreement and trees is acknowledged by the United Nations Framework Convention on Climate Change (UNFCCC), recognizing forests as crucial allies in combating climate change.

In conclusion, the Central Tree Banking (CTB) mobile monitoring application presents a promising solution to the challenges associated with tree conservation and environmental monitoring in the Philippines (Bhardwaj et al. 2021; Macusi et al. 2020; Daba & You, 2022). By improving the CTB App and implementing it as a compliance monitoring tool, there is potential to significantly contribute to the country's reforestation efforts, combat climate change, and create a sustainable environment (Gunaratne et al., 2021, Adewuyi et al., 2024). The support and collaboration of individuals, organizations, and the government are vital in achieving the goal of growing more trees and ensuring a greener and more resilient future for all.

2. RESEARCH OBJECTIVES

The general objective of this research study is to examine the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment. Specifically, the study sought to determine the following:

1. Determine the awareness and knowledge of the participants to the importance of conservation and environmental empowerment.
2. Describe the features of the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment.
3. Assess the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment, along:
 - a. Ease of Use;

- b. Effectiveness in Planting and Monitoring; and
 - c. Potential for Adoption and Promotion.
4. Explore the participants' actual experiences using the CTB app during tree planting activity.

2.1 Conceptual Framework

This research study is designed to investigate the Central Tree Banking (CTB) mobile monitoring application and its impact on tree conservation and environmental monitoring. The study utilized three key parameters to assess and evaluate the actual experience of the participants using the developed CTB along ease of use, effectiveness in planting and monitoring, and potential for adoption and promotion. Figure 1 illustrates the paradigm of the study.



Figure 1. Paradigm of the Study

The first parameter under the evaluation process, ease of use, focuses on evaluating the user-friendliness of the CTB App. Participants will provide feedback on statements such as "The CTB App is easy to operate," "I found the CTB App easy to download and install," and "I find the instruction in using this product understandable." This assessment aims to gain insights into the accessibility and user experience of the CTB App.

Meanwhile, the second parameter examines the effectiveness of the CTB App in facilitating tree planting and monitoring activities. Participants will rate statements such as "Using CTB enabled me to accomplish planting documentation more quickly" (rated on a scale of 1 to 5, with 5 being the highest), "Using CTB improved my planting know-how," "Using CTB made it easier to do my planting task," "I found CTB useful in planting and growing trees," and "The CTB is useful in monitoring the growth of my planted tree/s." By gathering these ratings, the study aims to assess the practical benefits and impact of the CTB App in supporting tree conservation efforts and monitoring tree growth.

Finally, the third parameter explores the potential for adoption and promotion of the CTB App by other schools and local government units in the country. Participants will respond to statements such as "The CTB App, if improved and fully developed, has the potential to be accepted and used by other schools and local government units in the country" and "I will promote and recommend the CTB App for use by my fellow students and other

planters." This evaluation seeks to determine the perceived scalability and endorsement potential of the CTB App, providing insights into its wider acceptance and potential for dissemination.

By employing these three parameters, this research study aimed to gain a comprehensive understanding of the CTB mobile monitoring application and its implications for tree conservation and environmental monitoring. The findings will contribute to identifying strengths, weaknesses, and areas for improvement of the CTB App, informing recommendations for its further development and broader adoption in initiatives related to tree conservation and environmental monitoring.

3. METHODOLOGY

Data for this research study was collected through a structured survey questionnaire, which served as the primary instrument for data collection. The questionnaire was designed to assess the participants' perception of the Central Tree Banking (CTB) mobile monitoring application in terms of its features, usability, effectiveness in planting and monitoring trees, and potential for adoption and promotion. The questionnaire employed a combination of Likert scale questions and open-ended questions to gather both quantitative and qualitative data.

The survey questionnaire was administered to a sample of 65 students who actively participated in the tree planting activity at Camarines Norte State College during the school year 2022-2023. These students were selected based on their involvement in practical tree planting activities and their firsthand experience using the CTB app.

The questionnaire consisted of three main sections. The first section focused on assessing the participants' awareness and knowledge of the importance of trees in cooling the Earth's temperature, cleaning the air and decarbonization, the urgency of planting more trees due to worsening climate conditions, and their sense of responsibility as citizens to plant and grow trees. It also explored their familiarity with the law that requires every Filipino 12 years old and above to plant a tree annually. The second section delved into the participants' preferences and choices regarding tree planting initiatives and the CTB app. It inquired about their acceptance of tree planting and growing as a graduation requirement, their opinion on whether growing a tree is a more suitable initiative than simply planting one, their preference for pricing strategies, the amount they would be willing to donate for one-year access to CTB for 10 trees, and their choice between different options related to the CTB app.

The third section focused on assessing the participants' level of acceptability of the developed CTB app. It encompassed three parameters: ease of use, effectiveness in planting and monitoring, and potential for adoption and promotion. The participants were asked to rate

statements related to these parameters on a Likert scale, indicating their agreement or disagreement. Additionally, they had the opportunity to provide qualitative insights and explanations through open-ended questions, allowing for a more in-depth exploration of their experiences and perceptions.

The data collected through the survey questionnaire underwent analysis using appropriate statistical methods. Quantitative data was analyzed using descriptive statistics to summarize the participants' responses and examine patterns and trends. Qualitative data from the open-ended questions was subjected to thematic analysis to identify common themes and generate deeper insights into the participants' experiences and opinions.

By employing this methodology, the research aimed to gain a comprehensive understanding of the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment. The insights generated from the survey questionnaire contributed to the evaluation of the CTB app's features, effectiveness, and potential for adoption and promotion, specifically among the students who participated in the tree planting activity at Camarines Norte State College.

4. RESULTS AND DISCUSSIONS

4.1 Awareness and Knowledge of the Importance of Conservation and Environmental Empowerment

Awareness and knowledge play a crucial role in understanding the importance of conservation and environmental empowerment. When individuals are aware of the significance of preserving our natural resources and the impact of human activities on the environment, they become better equipped to make informed decisions and take responsible actions.

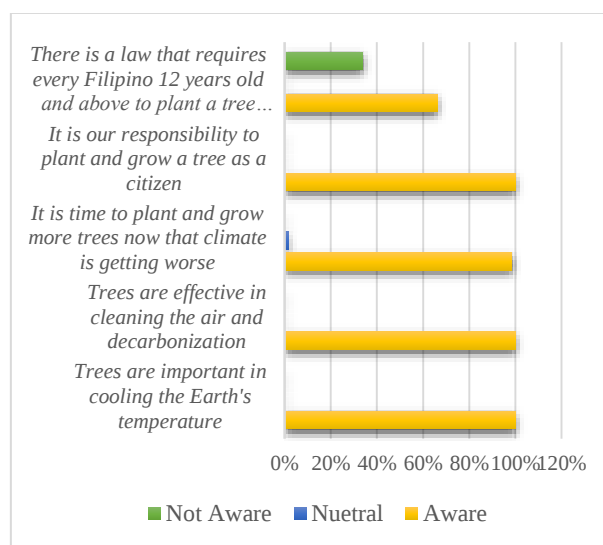


Figure 2. Awareness and Knowledge of Participants on the Conservation and Environmental Empowerment

Awareness encompasses understanding the interconnectedness of ecosystems, the role of

biodiversity, and the consequences of climate change. Knowledge, on the other hand, involves being informed about sustainable practices, renewable energy, waste management, and the benefits of preserving natural habitats. By fostering awareness and knowledge, the study aimed to empower individuals to become proactive stewards of the environment, driving positive change through conscious choices and collective efforts towards a more sustainable and resilient future. Through survey interview, the study found out of a high percentage of frequency aware participants to the importance of conservation and environmental empowerment, see figure 2.

The data reveals a strong level of awareness and knowledge among the participants regarding the importance of conservation and environmental empowerment, specifically related to trees. In terms of the significance of trees in cooling the Earth's temperature and cleaning the air, 100% of the participants demonstrate awareness and understanding. Similarly, all participants acknowledge the urgency of planting and growing more trees in response to the worsening climate conditions. The belief that it is the responsibility of citizens to contribute to tree planting and growth also receives unanimous agreement from the participants.

However, when it comes to the law requiring every Filipino aged 12 and above to plant a tree annually, only 66% of participants demonstrate awareness, while the remaining 34% are unaware of this legal requirement. This indicates a need for enhanced efforts to disseminate information and promote awareness about such environmental regulations. Overall, the data highlights a commendable level of awareness and knowledge regarding the importance of trees, but it also emphasizes the importance of continuous education and awareness campaigns to ensure widespread understanding and compliance with environmental responsibilities.

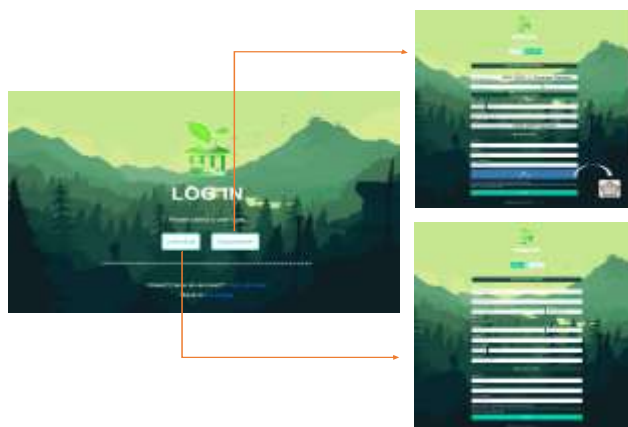
4.2 Features of the Central Tree Banking (CTB) Mobile Monitoring Application

The Central Tree Banking (CTB) mobile monitoring application is an innovative tool designed to facilitate tree conservation and environmental empowerment. This application offers a range of features aimed at promoting sustainable practices, increasing awareness, and engaging individuals in meaningful actions to protect and preserve natural resources.

With its user-friendly interface and comprehensive functionalities, the CTB app empowers users to actively contribute to conservation efforts, enabling them to make informed decisions and take part in a collective movement towards a greener and more sustainable future.

The login and registration feature ensures secure access to the application and user data, see figure 3. There are two ways to register and log in: through the Smart Phone Android platform or the website. The facilitator (administrator) registers the organization first, followed

by individual user registration under the chosen organization.



Registration/Log-in dash board which can be access through the web in this link, <http://greeninginitiatives.com/central-tree-bank/#/login>

Figure 3. Dashboard of Developed Application

CTB's advanced geo-tagging feature captures the coordinates of each planted tree, along with basic information about the tree and the planter. Users must enable the "Location" feature on their phone to determine precise coordinates and map the plant's location. This requires an internet connection; without a signal, the location feature will not work effectively. Assisted GPS helps in determining the exact location using nearby cell phone towers and Wi-Fi networks.

The documentation feature allows users to take photos (selfies with the planted tree) or short videos of the planting activity. The metadata includes GPS coordinates and geotags the photos. This data helps in tracking activities and tree growth, leading to better resource allocation and avoiding unnecessary costs. The app also provides information on tree types and allows map views in satellite or open street map images.

The CTB App produces digital passbooks with QR Codes for easy verification and authenticity. These passbooks record tree inspection details, such as size and status (survived or replanting needed), include information on tree types, and the total number of trees planted in a community or location. They can also be used to project fruit tree production and harvest periods.

The CTB app uses a banking concept for recording tree planting activities. The digital vault tracks updates such as new plantings or replanting (debit-credit entry). The app plans to adopt cloud storage for bulk data from multiple users, providing large capacity storage and access through cloud computing systems. By integrating these features, the CTB mobile monitoring application serves as a powerful tool for tree conservation and environmental empowerment, fostering a sustainable future through active community engagement and innovative technology.

4.3 Evaluation of Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment

The evaluation of the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment provides valuable insights into its effectiveness and impact. Through careful analysis and assessment, this evaluation seeks to determine the application's ability to promote sustainable practices, increase awareness, and engage individuals in meaningful actions towards preserving our natural resources. By evaluating its features, usability, and overall user satisfaction, this assessment aims to gauge the CTB app's contribution to fostering environmental stewardship and empowering communities in their efforts to protect and conserve trees. The findings of this evaluation will provide valuable feedback and recommendations to enhance the application's functionality and maximize its potential in advancing tree conservation and environmental empowerment.

Based on the findings of the study, the parameter evaluating the ease of use of the CTB mobile monitoring application for tree conservation and environmental empowerment indicates positive results. The weighted mean for the parameter "The CTB App is easy to operate" is 3.38 (see on table 1 below), which falls within the range of "Somewhat Agreed." This suggests that users generally found the app to be reasonably easy to navigate and use.

Table 1. Level of Acceptability of the Developed CBT in terms of Ease of Use

Parameter 1: Ease of Use	Weighted Mean	Rank	Interpretation
The CTB App is easy to operate	3.38	2	Somewhat Agreed
I found the CTB App easy to download and install	3.15	3	Somewhat Agreed
I find the instruction in using this product understandable	3.90	1	Agreed
General Weighted Mean (GWM):	3.47		Agreed
Standard Deviation (SD):	0.38		

LEGEND: (4.20-5.00) Strongly Agreed; (3.40-4.19) Agreed; (2.60-3.39) Somewhat Agreed; (1.80-2.59) Disagreed; (1.00-1.79) Strongly Disagreed.

Based on the findings of the study, the parameter evaluating the ease of use of the CTB mobile monitoring application for tree conservation and environmental empowerment indicates positive results. The weighted mean for the parameter "The CTB App is easy to operate" is 3.38, which falls within the range of "Somewhat Agreed." This suggests that users generally found the app to be reasonably easy to navigate and use.

The parameter "I found the CTB App easy to download and install" received a weighted mean of 3.15, also indicating a "Somewhat Agreed" response. While this score is slightly lower compared to the ease of operation, it still suggests that users generally did not encounter significant difficulties in downloading and installing the app.

However, the parameter "I find the instruction in using this product understandable" received the highest weighted mean of 3.90, indicating an "Agreed" response. This suggests that users found the instructions provided with the app to be clear and easy to comprehend,

enhancing their overall experience and understanding of how to utilize the features effectively.

Overall, the general weighted mean (GWM) for the ease-of-use parameter is 3.47, indicating an "Agreed" response. This suggests that, on average, users found the CTB app to be reasonably easy to operate, with clear instructions for usage. The standard deviation (SD) of 0.38 indicates a moderate level of agreement among the participants.

In conclusion, based on the findings of the study, it can be inferred that the CTB mobile monitoring application demonstrates satisfactory ease of use, with users generally agreeing that the app is easy to operate and the instructions provided are understandable. These positive evaluations of the app's usability are crucial for ensuring a seamless user experience and maximizing user engagement in tree conservation and environmental empowerment efforts. However, further enhancements and refinements may be considered based on user feedback to continually improve the app's ease of use and overall effectiveness in promoting environmental stewardship.

Meanwhile, based on the data provided by table 2 below, the evaluation of the CTB mobile monitoring application for its effectiveness in planting and monitoring trees indicates positive results. The parameter "Using CTB enabled me to accomplish planting documentation more quickly" received a weighted mean of 3.67, suggesting an "Agreed" response. This implies that the participants found the CTB app to be effective in streamlining the process of documenting their planting activities.

Table 2. Level of Acceptability of the Developed CBT in terms of Effectiveness in Planting and Monitoring

Parameter 2: Effectiveness in Planting and Monitoring	Weighted Mean	Rank	Interpretation
Using CTB enabled me to accomplish planting documentation more quickly	3.67	4	Agreed
Using CTB improved my planting know-how	3.71	3	Agreed
Using CTB made it easier to do my planting task	3.65	5	Agreed
I found CTB useful in planting and growing trees	3.75	1.5	Agreed
The CTB is useful in monitoring the growth of my planted tree/s	3.75	1.5	Agreed
General Weighted Mean (GWM):	3.70		Agreed
Standard Deviation (SD):	0.05		

LEGEND: (4.20-5.00) Strongly Agreed; (3.40-4.19) Agreed; (2.60-3.39) Somewhat Agreed; (1.80-2.59) Disagreed; (1.00-1.79) Strongly Disagreed.

The parameter "Using CTB improved my planting know-how" received a slightly higher weighted mean of 3.71, also indicating an "Agreed" response. This suggests that participants felt that using the CTB app contributed to their knowledge and skills in tree planting.

The parameter "Using CTB made it easier to do my planting task" received a weighted mean of 3.65, further supporting an "Agreed" interpretation. Participants found that the CTB app facilitated and simplified their tree planting tasks.

Additionally, the parameters "I found CTB useful in planting and growing trees" and "The CTB is useful in monitoring the growth of my planted tree/s" both received a weighted mean of 3.75, indicating an "Agreed" response. This implies that participants recognized the utility of the CTB app in both planting and monitoring the growth of trees.

Overall, the general weighted mean (GWM) for the effectiveness in planting and monitoring parameter is 3.70, suggesting an "Agreed" response. This indicates that, on average, participants found the CTB app to be effective in facilitating their tree planting activities and monitoring the growth of planted trees. The low standard deviation (SD) of 0.05 indicates a high level of agreement among the participants.

In conclusion, the data suggests that the CTB mobile monitoring application is perceived as effective in planting and monitoring trees. Participants agreed that the app helped them accomplish planting documentation more quickly, improved their planting know-how, made planting tasks easier, and proved useful in both planting and monitoring the growth of trees. These findings highlight the positive impact of the CTB app in enhancing tree planting practices and empowering individuals to actively participate in tree conservation efforts.

Lastly, based on the data provided by table 3 for the parameter assessing the potential for adoption and promotion of the CTB mobile monitoring application, the results indicate a mixed response.

Table 3. Level of Acceptability of the Developed CBT in terms of Potential for Adoption and Promotion

Parameter 3: Potential for Adoption and Promotion	Weighted Mean	Rank	Interpretation
The CTB App, if improved and fully developed, has the potential to be accepted and used by other schools and local government units in the country.	3.06	2	Somewhat Agreed
I will promote and recommend the CTB App for use by my fellow students and other planters	3.50	1	Agreed
General Weighted Mean (GWM):	3.28		Somewhat Agreed
Standard Deviation (SD):	0.31		

LEGEND: (4.20-5.00) Strongly Agreed; (3.40-4.19) Agreed; (2.60-3.39) Somewhat Agreed; (1.80-2.59) Disagreed; (1.00-1.79) Strongly Disagreed.

The statement "The CTB App, if improved and fully developed, has the potential to be accepted and used by other schools and local government units in the country" received a weighted mean of 3.06, indicating a "Somewhat Agreed" response. This suggests that while participants recognize the potential of the CTB app, they also believe that further improvements and development are necessary to enhance its acceptability and usability among other schools and local government units.

On the other hand, the statement "I will promote and recommend the CTB App for use by my fellow students and other planters" received a higher weighted mean of 3.50, indicating an "Agreed" response. This suggests that participants are willing to actively endorse and recommend the CTB app to their peers and other individuals involved in tree planting activities.

Overall, the general weighted mean (GWM) for the potential for adoption and promotion parameter is 3.28, indicating a "Somewhat Agreed" response. This suggests that participants recognize the potential of the CTB app for wider adoption and usage, but also acknowledge the need for improvements. The standard deviation (SD) of 0.31 suggests a moderate level of agreement among the participants.

In conclusion, the data indicates that while participants believe in the potential of the CTB mobile monitoring application to be accepted and used by other schools and

local government units, they also emphasize the importance of further improvements and development. However, participants express a willingness to promote and recommend the app to their peers and fellow planters. These findings suggest that continued enhancements and targeted promotion efforts can increase the adoption and usage of the CTB app, expanding its reach and impact in the context of tree conservation and environmental empowerment initiatives.

4.4 Participants' Actual Experiences Using the CTB App During Tree Planting Activity

During the tree planting activity, participants had the opportunity to utilize the Central Tree Banking (CTB) app to support and document their planting efforts. The CTB app provided a platform for participants to have firsthand experiences with its features and functionalities. They were able to navigate the app easily, access information about the accepted trees, and locate the designated planting areas through the map feature.

The app's monitoring capabilities allowed participants to track the growth and progress of their planted trees, while the documentation tools enabled them to capture and record planting activities through pictures and records. Support to the quantitative findings of the study, table 4 shows the thematic analysis of the participants based from their actual experiences using the CTB app during the tree planting activity.

Table 4. Participants' Actual Experiences Using the CTB App During Tree Planting Activity

Themes	Qualitative Data Summary
Convenience and Ease of Use:	(1) Participants appreciated the convenience and ease of using the CTB app, highlighting its user-friendly interface and intuitive design. (2) The app was praised for being easy to operate, download, install, and navigate. (3) Users found it convenient to access information, monitor trees, and locate their planted trees.
Useful Features:	(1) The CTB app was perceived as useful by participants, providing valuable functionalities for tree planting and monitoring. (2) The inclusion of a map feature was highly appreciated, allowing users to visualize the location of planted trees. (3) The app's ability to provide comprehensive information about the accepted trees, including the scientific names and donation details, was found to be helpful.
Monitoring and Documentation:	(1) Participants valued the CTB app for its monitoring capabilities, enabling them to track the growth and progress of their planted trees. (2) The ability to document planting activities through pictures and records was seen as a valuable feature. (3) The passbook and achievements sections of the app were highlighted as useful tools for tracking and celebrating tree planting accomplishments.

Based from the qualitative data presented indicates that participants found the CTB app to be convenient, easy to use, and equipped with useful features for tree conservation and environmental empowerment. The app's ability to facilitate monitoring and documentation of planting activities was highly regarded, contributing to a positive user experience. The findings emphasize the importance of user-friendly interfaces, comprehensive information, and functionality that supports monitoring and documentation in mobile applications designed for tree conservation efforts.

5. CONCLUSION

This study examined the Central Tree Banking (CTB) mobile monitoring application for tree conservation and environmental empowerment. The study found a

commendable level of awareness and knowledge among participants regarding the importance of trees. However, some participants were unaware of the legal requirement of annual tree planting, indicating a need for improved awareness efforts.

The qualitative data analysis highlighted the convenience and usefulness of the CTB app for tree conservation. Its user-friendly interface and comprehensive features have the potential to contribute to environmental stewardship and empower individuals in their tree conservation efforts.

6. RECOMMENDATIONS

1. Enhance Awareness: Develop comprehensive awareness campaigns to promote environmental responsibilities, including the legal requirement of annual tree planting. Utilize social media, educational institutions, and community outreach programs for effective dissemination of information.
2. Continuous Education: Implement ongoing education programs to enhance participants' knowledge about tree conservation and

environmental empowerment. Offer workshops, seminars, and online resources to provide up-to-date information and practical guidance.

3. Improve App Functionality: Incorporate user feedback to enhance the usability and effectiveness of the CTB app. Regular updates and improvements should address identified issues and ensure the app remains technologically advanced.
4. Collaborate and Partner: Foster collaborations with environmental organizations, government agencies, and local communities to maximize the impact of tree conservation efforts and promote environmental empowerment.
5. Monitor and Evaluate: Establish a system for long-term monitoring and evaluation of the CTB app's impact on tree conservation. This will help track progress, identify areas for improvement, and ensure the app meets users' evolving needs.

Implementing these recommendations will harness the potential of the CTB app, empowering individuals to actively engage in tree conservation and contributing to environmental stewardship.

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