MOBILE APPLICATION TO IMPROVE MENTAL HEALTH OF PERSONS WITH DEMENTIA

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Abstract—**Dementia is a disorder because of illness of the cerebrum, as a rule of a persistent or reformist nature, where there is the unsettling influence of different higher cortical capacities, including memory, thinking, direction, cognizance, figuring, learning ability, language, and judgment. To address these perplexities, this research has designed a mobile application to help caretakers, family members and friends to have better interaction with the people with Dementia and take care of them to improve the quality of living for the cognitively disabled. The specialty of this application is brain recovery activity to help the person with Dementia to recover their memory up to some extent. Also, system provides an inbuild music player with pre-loaded music list which is suitable for the persons with Dementia and application model trained as a chatbot understand the user's questions and chatbot responds. The paper further looks at the event's outcome, as well as the benefits, feedback, and potential work for the application and its users. The article emphasizes the artefact's effectiveness and how it accomplishes its goals and priorities. The researcher discovered that the chatbot has a better success rate of accuracy, with in the range of 80-90% of accuracy showed 60% success rate out of general responses. This importance demonstrates that, to achieve a higher accuracy score, the chatbot must also be accurate. The accuracy of the chatbot and enhancing the available features in the mobile healthcare application, also the researcher planning to add new features to the system, as a future work.**

[2] ***Keywords- Dementia, Counselling, Application, Alzheimer's, Relaxation Methods, Music, Artificial Intelligence, Machine Learning***

[3]

I. INTRODUCTION

The proposed project is to develop a mobile application for people with Dementia and Alzheimer's. Dementia is recognizing as one of the growing social health problems among older people in society. This is not a problem for the individual concerned, but it causes stress to the family members, neighbors, friends, and others who are involved in supporting a person with Dementia. Dementia is caused by abnormal brain changes, damage to or loss of never cells and their connection in the brain and communication problems, a change in personality, and a reduced ability to carry out daily activities such as washing or dressing. Depending on the area of the brain that is affected, they may face experiences in short-term or long-term memory loss. It may lead to physical malfunctioning and disability too. Simply the drugs do not use

for these people to improve their mental stability but if the patient is at risk of harming themselves or others, they must seek medical attention to take drugs. Otherwise, doctors recommending music sessions and sound therapies.

Since this is a modern era there is a strong relationship between humans and information & communication technology. By using information technology, it can develop solution applications. This proposed project will help people with dementia maintain and improve mental functions. Since persons with Dementia have difficulties in concentrating, their span of attention is low, and they project irregular behaviors. Due to this reason, the caretakers find it difficult to handle them. Here the researcher can build their attention through calm sounds such as water flowing, the sound of birds, playing soothing music to calm the Dementia patient down, and have a conversation about the sound and what they heard. From the beginning by studying the patient's behavior and output, the researcher can get to know his or her likes, dislikes, and interest to develop a successful application to improve their concentration and span of attention. For that, the researcher needs to provide activities to remember things, ask questions about their past and what they remember without giving any sort of pressure or stress to the patient. By using attractive colors to the user interface, the system can draw the patient's attention to the device.

A. Dementia Statistics in the Population

Alzheimer's disease affects an estimated 5.7 million Americans. The number of individuals living with Alzheimer's dementia in the United States is expected to rise to 13.8 million by the middle of the century, largely due to the aging younger generations. Official death certificates reported 110,561 deaths from Alzheimer's disease in 2015, making it the sixth highest cause of death in the United States and the fifth leading cause of death among those aged 65 and above. Fatalities from stroke, heart disease, and prostate cancer dropped between 2000 and 2015, but deaths from Alzheimer's disease climbed by 123% [1].

In 2017, an estimated 18.4 billion hours of care were provided to persons with Alzheimer's or other dementias by over 16 million family members and other unpaid caregivers. The cost of this care is estimated to be more than $232 billion, but it also includes the increased risk of emotional distress and bad mental and physical health consequences for family caregivers [1].

Dementia patients are a particularly difficult user group to include in the development of interactive technologies that might help them. It may also be difficult to enlist the help of family caregivers of dementia patients, as they are likely to be elderly and unfamiliar with technology [2]. Paid care workers, especially those who are younger, maybe unsure of the advantages of technology and lack confidence in their abilities to incorporate it into their job. The authors of this study have spent the last seven years developing and evaluating a multimedia computer system to enhance communication between persons with dementia and caregivers, in collaboration with people with dementia, their families, and professional care professionals [2].

B. Challenges for this Population

Although most industrialized countries' average life expectancies are increasing due to constant improvements in modern medicine, this does not guarantee that health concerns or illnesses associated with old age would not impact the growing older population. On the contrary, elderly people may be vulnerable to illnesses that are not life-threatening but might degrade cognitive capacities, making them increasingly dependent on assisted living facilities and services.

Dementia and Alzheimer's disease affect the capacity to think intellectually, communicate, make rational decisions, behave lucidly, and recall memories in older individuals. As a result of their tendency of repeating oneself and losing sight of what they are saying, their speech patterns alter. Memory loss, incomprehensible speech, and frequently illogical conduct are typical in people with late-stage dementia, especially among the elderly. One's speech deteriorates even further because of progressive loss of speech, to the point where only a few words can be saying or one can only communicate by crying out [3].

Patients with dementia have a variety of communication problems, yet good communication enhances the quality of life for those with dementia [4]. The inability to locate the proper words, particularly names of objects, is an early indicator that a person's capacity to speak has been harm by dementia. The individual may use an inappropriate term or may not be able to find any at all [5]. Communication difficulties grow increasingly severe as the disease advances, eventually leading to a full incapacity to communicate. The lack of speech can exacerbate behavioral symptoms of dementia, such as sadness, aggressiveness, anxiety, and sleep problems. Meaningful attempts at contact via technology can help alleviate these feelings and perhaps reduce their intensity. Delusions can affect as many as 30% of dementia sufferers [6]. Both the patients and the caregivers may be distress by this shift in perception. Using technology to assist a patient to reorient, such as presenting photos, YouTube clips of popular television shows, presidential addresses, and so on, can help to calm a patient who is terrified and overwhelmed by emotions of uncertainty. Dementia patients become less able to operate on their own as their symptoms worsen, and they become increasingly reliant on the care of people around them, necessitating their placement in nursing facilities, which provide round-the-clock personnel and experts. Their

caregivers concentrate their efforts on alleviating any anxiety or pain they may be feeling. Speech and language therapists are available in hospices and residential homes to help patients communicate more effectively. Individual attention, greater physical exercise, and excessive hand motion can help dementia patients feel less aggressiveness and disorientation [3].

Because persons with dementia grow increasingly dependent on others around them, caring for them causes stress in both the family and the caregivers. Residents would show indications of paranoia or feel intimidated by individuals who helped. It is uncommon for nursing personnel to encounter antagonism when bringing patients for showers, toilet breaks, or walks. In the contact between caregivers and residents, the increasing agitation adds to stress. Geriatric institutions may create an atmosphere favorable to enormous stress and anxiety because of this, as well as the nonsensical or restricted speech that is typically adopted as these conditions develop [3].

II. BACKGROUND

A. Technology Bridges Gap to Improve Quality of Life

The problems between individuals and their families become more difficult as they age or develop impairments. Traditional techniques of social communication diminish and generate irritation. Technology, on the other hand, can enhance the quality of life for those who are suffering from a cognitively debilitating condition. The social concerns associated with utilizing technology can be reduced via good training and skill, which enhances the connection between the individual and the technological equipment in use [3].

Historically, society has considered the aging population as technologically illiterate. The new study, on the other hand, contradicts this notion. As the number of 'baby boomers' reaching 65+ continues to rise, bringing the total number of senior citizens in the United States to 79 million, more will become digitally linked to the rest of the globe. As a result, many older individuals are taking advantage of the Internet and social networking sites to interact with others [7]. Computers continue to excite the brain of older individuals, whether it is keeping in touch with old friends or family, shopping online, or playing games. The stimulation of cognition and memory is critical for the health of older individuals, especially because the number of older adults suffering from Alzheimer's disease and dementia is on the rise.

B. Service Learning

In an era when Alzheimer's and dementia in older individuals is on the rise, caregivers are looking for novel ways to address the problem. The use of mobile devices to enhance the cognition of older individuals and patients with Alzheimer's disease is one of these innovative options. According to new study, playing brain, memory, and problem-solving games might help stimulate the brain and lessen the symptoms of Alzheimer's disease. The usage of the computer game Smart brain enhanced memory in Alzheimer's patients at a Spanish

adult day care center. Furthermore, researchers found that when normal therapy and computer brain games were combining, they "greatly increased the typical psychomotor stimulation." The cognitive advantages also extended to a period of 24 weeks [8]. The use of brain games and other computer-based stimulation treatment has offered healthcare professionals, caregivers, and patients' fresh perspectives. A new market for healthcare experts and software developers has emerged because of research and therapeutic initiatives from across the world and in the United States. Because of the growing usage of the Internet by older individuals, a new era of Web Accessibility (WA) and Assistive Technologies has emerged (AT) [3].

Earlier, older persons and people with disabilities found it difficult to keep up with the need for IT integration in their everyday life. Unwanted feedback from a gadget or the Internet prompted many older individuals to shun modern technologies altogether due to complicated menus, small letters, and the fear of damaging the machine. Developers pushed for the creation of computer AT and WA as society progressed into the Digital Age and more people expressed displeasure [3].

The usability and accessibility of the Internet and computing devices have enhanced because to new assistive technologies and web accessible features. Despite these advancements, these technologies have failed to fully integrate into mobile tablet computers.

C. Real-World Projects

Technology has seldom been using as a tool to assist dementia sufferers and caregivers. Because the elderly is generally inexperienced with or incapable of using computers, this medium is unlikely to be used to ameliorate interactions between dementia patients and their caregivers. The tablet's simplicity, as well as its accessibility via its touchscreen feature, make it user-friendly for even the most novice. When intelligible speech is unable to be express, applications can be created to aid communication. The idea of using tablets as a medium to meet the needs of dementia sufferers has received little attention. Although developing apps for dementia sufferers is not always consider "sexy," it might nevertheless appeal to student programmers because it is unusual and unique from other programming projects. Furthermore, the concept of developing answers to real-world issues creates an atmosphere in which the time spent coding feels considerably more meaningful than if it were done merely for the sake of grades [3].

D. Student Projects

To accomplish their term projects, students are push to establish teams with a variety of skill sets. Many computer science students lack the creative abilities or drive to create visually attractive icons and symbols. Students quickly discover the benefits of collaborating with people from various fields, which is sometimes beyond their comfort zone [3].

III. MOBILE APPLICATIONS FOR DEMENTIA PATIENTS

A. Sundowning and Agitation

Alzheimer's and dementia patients typically get agitated late in the afternoon or early evening, according to research. "Sundowning" is a term used by those in the field to describe this condition [8]. As the sun sets, dementia sufferers experience disorientation and other symptoms known as sundowning. Increased disorientation, emotional stability, agitation, resistance to treatment, and combativeness are all common symptoms. During these times, institutional personnel and caregivers face everyday challenges from their patients and loved ones [9]. To calm these patients and provide relief to caretakers, Geotechnologists have begun developing "sundown" smartphone applications. The goal of developing apps for iPads and tablets is not just to reduce agitation in dementia sufferers.

Apps have the potential to aid in the reduction of depression and improvement of overall quality of life in dementia patients. Indirectly, the app can assist the caregiver, particularly if the patient is dwelling in the family home. Often, the caregiver needs early evening time to cook dinner. During moments of agitation, essential home duties are frequently disrupted. If the agitation episodes become more frequent daily, the caretaker may conclude that the elderly relative should be institutionalized. As a result, apps may be able to assist in creating a setting in which a dementia patient can age in place for a longer period. Aging in place at the family home is considerably less expensive than being admitted to an aging-in-place institution.

Not only do iPads and Android tablets have built-in applications for email, video conferencing, books, videos, and photographs, but they also have apps for email, video conferencing, books, videos, and images. All these applications are great for engaging your brain!

B. Music and Memory

Various groups, such as musicandmemory.org, have shown that music encourages otherwise unresponsive dementia patients to become more active and communicative. http://www.youtube.com/watch?v=5FWn4JB2YLU

C. Busy-Boards

Busy-Boards are mobile applications that are intended to grab the user's attention by asking them to perform a basic activity. When a person is having an emotional meltdown, busy-boards seek to calm them down. Tantrums are common in people with Alzheimer's disease or dementia as the condition advances. Anger can trigger by a lack of or unwillingness to communicate socially, in a social setting, in medicines, or in bewilderment. Unfortunately, family members or nurses may find it difficult to control these outbursts. Busy-boards intended to provide these persons a task to perform and a reward in exchange for finishing the assignment. A collage of touch interactive animals or baby icons, for example, might use in a busy-board app. A sound may play and/or the explanation can display by interacting with and touching the right icon. This may use to create cognitive simulations. Busy-

boards can be a unique way to assist preserve or increase cognitive memory as the disease develops.

D. Existing Software Applications

Other beneficial applications for Alzheimer's and dementia sufferers to interact with family members and doctors are available. Verbal communication gets increasingly difficult as the illness develops. Alternative communication methods and therapies, on the other hand, can help AD and dementia sufferers enhance their social relationships. A6.5The combination of different speech modalities and assistive technology to aid communication through verbal and visual expression is known as augmentative and alternative communication (AAC), which is commonly referred to as an umbrella word [3]. Unfortunately, AAC is frequently employed to help children with autism or other social communication disorders (s). However, the current study suggests that AAC can help Alzheimer's and dementia sufferers [10].

On the app stores, you may get a variety of iPad and Android mobile apps. These applications frequently include a variety of graphic images depicting emotions, typical activities, vocabulary, automated conjugations, and audio output. These apps may upgrade over time to meet the changing demands of the patient, in addition to their functionality. For family members and healthcare facilities, the cost-effectiveness of these mobile apps is critical. Unlike specialized and dedicated AAC equipment, which can cost thousands of dollars, mobile tablets and AAC apps are far less expensive, lowering healthcare expenses [11].

Despite recent advances in AT for desktop PCs, mobile tablets (Android, Apple's iPad, etc.) have not completely incorporated assistive technologies to aid older people, particularly those who suffer from Alzheimer's disease and dementia. Unfortunately, there are several challenges that older persons have when using these devices. The layout and usability of the Operating System (OS), interactivity, and device size, including weight, are all barriers.

Even though mobile operating systems, particularly Android and iOS, have become more accessible over time, mobile platforms still lag their desktop counterparts. Many assistive technologies are built into operating systems such as Microsoft Windows and open-source Linux. Menus have streamlined, and keystrokes have been introduced to organize and perform simple actions more efficiently. Many visually challenged people have trouble distinguishing between low-contrast colors. IT experts are increasingly concerned about the complexity and performance of mobile operating systems as mobile technology advances [3].

IV. USERBILITY OF MOBILE APPLICATIONS

Through tablet technology, this sundown project aims to improve the quality of life for older individuals with Alzheimer's disease and dementia. Each participant is handed iPads with their favorite music and photos. Surprisingly, elderly people pick up the iPad rapidly. While the music is playing, the participants learn how to access the photo pages.

They lured to discuss the photographs that depict their experiences. Caretakers, primarily sons, daughters, and spouses, requested to assist in the search for appropriate family pictures. When dementia patients' memories awakened by familiar sights and sounds, the theory is that they will "wake up" by starting to comment on the photos and moving to the music.

Patients were energetic and vibrant with preferred music and family photographs in a pilot last semester, when study assistants visited with participants weekly and stimulated older adult participants with tablets. Graduate student research assistants give cognitive and loneliness evaluations to older adults diagnosed with dementia before and after the study. Participants usually assessed using a historically validated instrument as well as a more contemporary technique for detecting moderately impaired persons [3].

V. METHODOLOGY

The methodology chapter discusses the methods used to tackle the case and the event methodology that was used. The segment further discusses how data and information are gathered and analyzed. The instruments used to design the artifact correctly will be included in this segment.

Selecting which approach to be ideal for the chosen project to be built is crucial, since it will affect the project's overall results. Even though the application cantered in a very straightforward relation to its customers, flexibility, and most importantly, specializing in the project's requirements, the use of Agile Scrum technique has now finalized, this system will be beneficial to the project. The technique enables a requirement analysis at the outset of each sprint, allowing for small changes while ensuring stability and making appropriate modifications during the testing process. Fig. 1 explains the agile scrum technique described by the characteristics mentioned below.
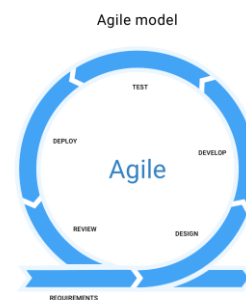

Fig. 1. Agile Methodology

A. Requrement Gathering

Requirement gathering may be described as the process of learning about the desires and needs of the target audience through analysis. During the need and collection process,

significant and contributing analysis is required to determine the subject's adequacy. A market survey was performed, and this project's research papers were used.

The two popular methods for combat operations were a literature analysis and an industry survey on emerging platforms. For the literature review, the IEEE Xplore database and the Google Scholar database were both useful and accurate resources. The framework has incorporated the most recommended and crucial features, considering the most recent years of publications within the last eight years, and gathering data to maintain a qualitative up-to-date analysis area and to examine widely regarded knowledge and requirements needed by the application. The goals for this approach and, as a result, the additional changes that need to make, can be check in a later section.

B. Design and Implementation

The task entailed reviewing the specifications and deciding on a system design to go forward with. Diagrams of functional flow, use case, sequence, and data model created during this project. According to the above work breakdown structure designing the wireframes and designing the user interfaces are the tasks done in the design phase.

1) Interface Design

The mobile application consists of different interfaces which have been designed by the developer. Why Facebook uses the blue color theme? The researcher researched colors that are suitable for the application. Most of the sites recommended color blue reason state that users grab their attention for blue. The researcher selected the blue color as the theme color because the reason is users easily get attention to blue. Finally, the researcher decided to use blue and white colors combination. Then the researcher thought to use creative pictures for dashboard icons where user can easily remember the tile even though the user cannot remember the name of the tile. For example, the user can identify the Demibot interface by looking at the Demibot icon even though he cannot remember the name Demibot name. Each interface having its own tasks or it redirects to another interface for the user. The system ran smoothly because the interfaces were planned on time. The interfaces were first established, and a strategy for developing them was devised.

2) Functional Design

It is necessary to create a specification if the suggested framework is to apply. This project, which was written in the Java programming language, was developed using the Android Studio IDE. According to the report, the healthcare application was found to be more user-friendly, as well as appropriate and trustworthy to use.

The proposed system database using the Firebase database which is easy to handle active login accounts. At the earlier stages of the research, the researcher needed an idea of which database Firebase or SQLite is suitable for the proposed system. So, the researcher searches are pros and cons of both databases. After the help of the supervisor, the researcher decided to choose the Firebase database. It is easy to use Firebase because Google provides the facility of Firebase Authentication for every registration. A firebase database can allow cloud data backup and login, and the cloud base database will be accessible from anywhere and on any computer using firebase authentication. But later the researcher used SQLite for storing reminders inside device memory.

C. Development

During this project, implementation is done using sprints according to the Software Development Life Cycle model chosen. According to the work breakdown structure, the researcher needs to divide the whole development parts into small parts which are called sprints. Each sprint represents a function that is related to the proposed system. After the end of every sprint, we need to test the sprint before we step into the next sprint.

The research component of the proposed system was developed using Python language to develop the backend of the "Demibot" in the application. The researcher developed the Demibot separately and the researcher used PyCharm IDE with the Anaconda plugin to develop the chatbot. To develop this chatbot the researcher used Natural Language Toolkit (NLTK) which is a Python-based collection of libraries and programs for symbolic and statistical Natural Language Processing (NLP) for the English language. Also, the researcher used TensorFlow free and an open-source library to develop the chatbot which is helpful for Machine Learning (ML). It can used for a variety of functions, but it focuses on deep neural network training and inference. The researcher user Keras API for deep learning in which is written in Python. Keras is running on top of the TensorFlow platform. It was created with the goal of allowing for fast experimentation. It is critical to be able to go from concept to outcome as quickly as possible while doing analysis.

After the development of the chatbot, the next step is to give training to the chatbot. For that, the researcher creates a dataset and modified it accordingly which is suitable for the application. For this, the researcher used JSON arrays called intents. The JSON file is used to generate a set of messages that the user is likely to type and map to a set of suitable responses. In these intents the researcher modified the tags which describe the patterns and responses in one word, patterns are the all the possible questions user can ask from the chatbot which is related to the tag, responses are the replies which given by the chatbot.

D. Testing

The research was performed to decide when and how the system could be tested, and the testing was carried out accordingly. After the training integration must be done. Before that, we need to test the connection between the user and the chatbot. For that, we need to use the application called Postman. For the connection, the method needs to take either the 'GET' or 'POST' method. After that need to provide the following URL link http://IP Address: Port /chat? ChatInput

where the researcher must provide the PC IP address with 5000 also provides the app route name 'chat' and finally need to provide the key 'ChatInput' then need to input a value and send. After the testing part is done, the researcher needs to call the URL link inside the Java chatbot class assign to a String URL and set the requested String request method as POST and the URL.

After completing each sprint, the developer tests each sprint. Before releasing the final system. The developer proceeds with the unit testing, system testing, and acceptance testing. Test conducted front end and back end separately.

E. Evaluation

It is important to check the accuracy of the system as well as check the accuracy of the most important function in the system. It is the chatbot that is developer implemented in the system. After conducting a questionnaire, users provide feedback the researcher discovered that the chatbot has a better success rate of accuracy, within the range of 80-90 percent of accuracy showed 60 percent success rate out of general responses. The following equation shows the accuracy level of the chatbot.

$$Accuracy = (TP + TN) / (TP + TN + FP + FN) * 100$$

Above equation measuring the accuracy using the confusion matrix. By substituting values nearly 60% accuracy from the chatbot Fig. 2 depicts the figures how results allocating after the testing.

$$Precision = TP / (TP + FP) * 100$$

The above equation Precision is using to calculate the percentage of positive instances out of the total predicted positive instances. Here denominator is the model prediction done as positive from the whole given dataset. Take it as to find out how much the model is right when it says it is right. After we calculate the Precision, we got the answer of 66.67% of positive instances out of the total predicted positive instances from the developed model.

$$Specificity = TN / (TN + FP)$$

The above equation Specificity is using to calculate the Percentage of negative instances out of the total actual negative instances. Therefore denominator (TN + FP) here is the actual number of negative instances present in the dataset. It is like recall but the shift is on the negative instances. Like finding out how many healthy patients were not having dementia and told they do not have dementia. After we calculate the Precision, we got the answer of 62.5% negative instances out of the total actual negative instances from the developed model.

$$Recall = TP / TP + FN$$

The above equation Recall is using to calculate the Percentage of positive instances out of the total actual positive instances. Therefore denominator (TP + FN) here is the actual number of positive instances present in the dataset. Take it as to find out how many extra right ones, the model missed when it showed the right ones. we get the answer of 60% positive instances out of the total actual positive instances from the developed model.

$$F1 \, Score = 2 * precision * recall / (precision + recall)$$

The above equation F1 Score is using to calculate the harmonic mean of precision and recall. This takes the contribution of both, so the higher the F1 score, the better. See that due to the product in the numerator if one goes low, the final F1 score goes down significantly. So, a model does well in the F1 score if the positive predicted are positives (precision) and does not miss positives and predicts them negative (recall). One drawback is that both precision and recall are given equal importance due to which according to our application we may need one higher than the other and the F1 score may not be the exact metric for it. we getting the answer of 63.16 harmonic mean of precision and recall from the developed model.

n = 180	Actual: Yes	Actual: No	
Predicted: Yes	TP = 60	FP = 30	90
Predicted: No	FN = 40	TN = 50	90
	100	80	

Fig. 2 - Confusion Matrix

All these figures above given were calculated after providing the fully developed system to the caretakers of people with Dementia. N = 40 where the total number of people in the target population. Out of these 40 targeted people, the researcher provided n = 10 random people selected to test the developed application and get feedback from them. All the values in the confusion matrix in Fig. 2 were taken after analyzing the collected data from the respondents.

VI. RESULTS AND DISCUSSION

A. Research Observations

Students have been studying and creating mobile applications for older individuals with Alzheimer's disease and dementia since January 2012. Students met with patients in senior care centers to assess the usefulness of mobile applications after they were built.

B. Challenges in Touchscreen

Many issues with the Android smartphone were found throughout these tests. The touch sensitivity of Android tablets was one of these barriers. The most difficult aspect of the touch interface, according to the patients who participated, was its accuracy. When it came to contacting the gadget, several of the residents at the elder care facility utilized the top of their fingernails.

Unfortunately, capacitive touchscreen panels are used on most mobile tablets, including Android and iPad. Capacitive touchscreen panels, unlike typical resistive panels that simply require an item to put pressure on the panel, generally a pen, require an electrical conductor from an object, such as a fingertip, to respond. Furthermore, older individuals, particularly Alzheimer's or dementia sufferers, lack the cognitive ability to grasp this distinction; as a result, they may feel dissatisfied with the application and give up using it. Furthermore, the arrangement of the operating system and touchscreen panels might provide significant problems. Patients got irritated, for example, when they accidentally pressed an object on the taskbar rather than a user button at the bottom of the application. Because touch accuracy is already impaired, it is critical that program buttons and the taskbar are not too close together. Patients may startle or be confused by application noises and device feedback. Another issue to consider is the device's size and weight. Many people who took part in our trials at senior care centers were unable to hold the gadget unaided. Many people needed a tablet or a stand to hold up the tablet. Many patients complained that holding the gadget was too difficult and that they could not participate at the same time. Sarcopenia is a term used to describe the loss of muscular mass, strength, and function as people get older. Furthermore, the screen size should not be less than 10.2 inches. Glossy displays on tablets can also cause glare.

C. Usability

For example, Jungle App is a mobile app that displays photos of animals in a jungle background. When the user taps a picture of an animal, the screen displays the animal's name as well as animal noises. The goal of the Jungle App was to offer residents a stimulating activity that they could utilize and enjoy. This exercise is facilitated both in a group setting and on an individual basis. When participants completed the exercise in a group and were able to remark on what they were doing with the other, the reaction was the best. When a partner joined them, whether it was another resident or a member of the staff, those who showed little to no interest when completing the activity on their own had an entirely different reaction.

The gadgets themselves posed their own set of difficulties. One of the first challenges was getting the people to understand how to use the gadgets. Residents needed to be trained or reminded how to properly touch the screen without using their fingernails, but rather the end of their fingers as an example. Residents would also be more likely to drag their fingers around the screen instead of touching it. The fact that the residents would tap the photos while holding the surface of the screen with their other hand added to the program's complexity. This issue may readily solve by using tablet coverings with grips.

While a few individuals were able to easily discriminate between the animals, the bulk of the inhabitants had trouble doing so. It is possible that this is due to the reduced size of some photos, which makes distinguishing precise qualities unidentifiable. Furthermore, the hue of a picture had to be examined because the image of one animal blended in well with the background. To achieve some uniformity, the manner the creatures depicted was also re-examined. The picture of wolves, for example, is portrayed as a group, whereas the other animals are shown separately. This might have created some confusion because some people did not identify the image as a pack of wolves.

Residents became more confident in their use of the Jungle App after more time spent with it. They quickly grasped how the program worked and what they may expect after pressing on each of these photos after being exposed to it. As a result of the program, their cognition has improved.

D. Outcome

The first goal was to investigate and document the many kinds of quantitative health outcomes that mobile healthcare application interventions for people with MCI, Alzheimer's disease, and dementia employed. We discovered that 101 of 476 (21.2%) of completely examined papers were eliminated due to a lack of health outcomes. There were also discrepancies in the health outcomes chosen by the researchers [12]. There appears to be a lack of agreement on which healthcare outcomes should utilize to evaluate mobile healthcare application treatments for people with dementia. Cognitive function, quality of life, mood and well-being, and behavioral and psychological signs of dementia were the most often utilized health outcomes. In this research, there is a higher requirement for consistency in the health outcomes for those with cognitive impairment.

E. Efficiency

The study's second goal was to see if there was any evidence of the efficacy of mobile healthcare application treatments for people with cognitive impairment that included at least one quantitative health outcome in the evaluation. There is presently minimal evidence to support the efficacy of most mobile healthcare application therapies in improving the health of people with cognitive impairment, according to this comprehensive review. The number of mobile health applications is increasing [13]. The creation and testing of these applications, as well as their claims of value, are, however, subject to little supervision and rigor. Lumosity, a subsidiary of Lumos Laboratory, was the most recent well-publicized example of a firm accused of making unsubstantiated medical claims regarding the advantages of their cognitive training mobile healthcare application. The firm deceived consumers by saying that its medication "delays age-related mental decline and protects against dementia and Alzheimer's disease," according to the Federal Trade Commission [14]. Without rigorous RCTs to establish the

efficacy of mobile healthcare application therapies, mobile healthcare applications risk becoming the latest "snake oil" treatment for dementia and related diseases. More research is needed to see which applications are most helpful in improving patient outcomes.

F. Limitations

Interrater reliability, often known as kappa, is not calculated, which is a drawback. Because the initial search method for this study did not specifically target cognitive training, there may have been researching in this area that was missed. The bulk of studies in the field of mobile healthcare and in our review are modest in size and lack appropriate quality in study design [12].

VII. CONCLUSION

Despite these difficulties, there are several easy solutions available. Mobile platforms simply need to look to their desktop counterparts for inspiration. The desktop platform has spawned a plethora of computer assistive technologies. The OS themes may change to use high-contrast colors. Users with vision impairments can utilize virtual magnifiers to improve their readability of small text. Furthermore, dictation software and text-only web browsers have enhanced the accessibility of applications for persons with impairments. Furthermore, program buttons should not be too close to the Android taskbar. While tablet touch accuracy can be challenging to resolve, Android systems allow users to adjust the sensitivity of the touch interface as well as get vibrating feedback when the screen is touched. Screen protectors can assist decrease glare, especially in locations where there is a lot of sunshine. Patients who use mobile tablets may benefit from rubber cases with adjustable supports, particularly while utilizing a table or lying-in bed. These small adjustments can help people feel less frustrated and improve their quality of life.

Today people who are taking care of persons with Dementia face a lot of difficulties in how to look after their loved ones in situations like this. Due to the increase of the Dementia problem caretakers or family members must have an idea about it. Non-pharmacological dementia treatment places a strain on caregivers who are caring for a patient with this lifelong illness. Caregivers are often called in to support their caregivers with everyday operations. They are, however, recommended to foster practical independence. Functional independence in persons with Dementia was enhanced and caregiver burden was reduced when a discrete tracking system was used. In this paper discusses a method that uses smartphone apps to increase the efficiency of dementia patients' care. Mainly Dementia is related to people who have fewer brain functionalities and the researcher must find any solution on the technological side.

VIII. FUTURE WORK

Since this is a researched level application using natural language technique due to a limited period and the researcher's knowledge level and experience, furthermore the researcher going to feed more data to the chatbot as intents and more focus on creating apps to detect early symptoms of dementia using prediction techniques. Efforts will focus on developing apps to help caregivers and individuals reveal early warning signs of dementia, thus receiving medical support and provisions. Perhaps at the very least, carefully utilizing appropriate brain exercises and nutrition.

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