CHAPTER I

INTRODUCTION

Modern technology has significantly changed how families often do everyday tasks. The majority of people's homes are now equipped with electronics and automation. The ability to communicate with someone halfway around the world is a result of technological advancement connecting people from all over the world. These days, one may obtain any type of information in a matter of seconds. Fast technical advancements typically aim for convenience, but too much convenience causes life to speed up, and the typical working person is actually busier than ever these days.

Nowadays, most people rely on cellphones and applications to manage their businesses, careers, and practically, their everyday lives. According to the study of Digital Lives Decoded (2022), 93% of their respondents believe that their mobile usage improves quality of life. It is surely possible to make an application that guides people how to cook in an enjoyable way. As the technology of the current world continues to progress, it provides the people immense convenience and a better way of living. In the Philippines Statistica (2024) reported that an estimated 97 percent of Filipinos will use this device by 2029, highlighting the importance of mobile devices. The researchers take the advantage of this to create a compact recipe book-like application with voice assistance to help users in meal preparation.

The proponents conducted a study about an Android-based food and recipe recommendation application called TastyTalk that helped users. The earlier system featured tools for food recipe recommendation with randomized dish selection and video tutorials. The current researchers aim to enhance the cooking tutorial experience

with TastyTalk with an interactive voice assisted mobile application that served as a guide for users in meal preparation.

Project Context

Cooking can be challenging for individuals who are busy, inexperienced, or looking for new dishes to try. Food preparation is the most important routine in every home. The general health of the family depends on the meal consumed. Information on the proper way to cook, and availability of ingredients can be easily accessed through the cellphones by using the TastyTalk application.

Based on the preliminary investigation conducted by the researchers people do have problems regarding their daily meal preparation. In order to assess the resident's experiences in terms of prepping their everyday meals, the researchers conducted a preliminary survey that intends to unfold the struggles they are going through whenever they think of food they ought to serve their family every day.

The study intended to implement TastyTalk, an interactive voice assisted cooking guide application for users. The proposed system was consisted of dish selection, interactive voice assistance, and monitoring of cooking skills of the user. Visual Studio Code was used for design implementation and development with dart extension as primary programming language, while firebase and cloudinary was used for database management. Following the software development, testing and usage assessment was carried out to ensure its effectiveness, ease of use, and usability for future implementation.

Research Objectives

The study aimed to develop, design, test, and evaluate the user acceptability of the TastyTalk, a smart voice-assisted cooking guide with ingredient lists, timer alerts and monitoring of cooking skills levels.

.

Specifically, this study aimed to do the following:

1. To design and develop a voice assisted cooking guide application that allowed the users to browse dishes on the application as well its recipe and ingredients, together with interactive voice command for assistance.

2. To test the functionality of the developed mobile application based on its features, are as follow:

   a. Account Registration;

   b. Browsing of Recipe;

   c. Voice Assistance;

   d. Cooking skills level monitoring;

   e. Timer alerts

3. To evaluate user acceptance of the developed mobile application based on the following elements.

   a. Quality Factors;

   b. Perceived Ease of Use;

   c. Perceived Usefulness;

   d. Attitude Towards Using and

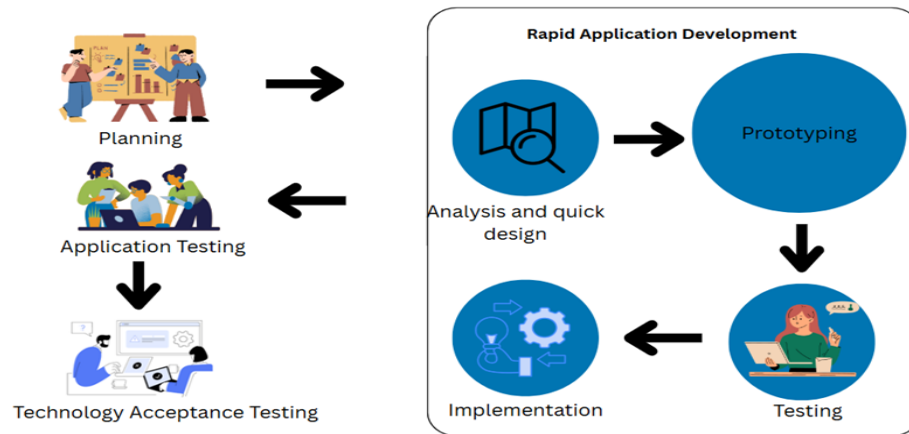   e. Experience

Conceptual Framework

Figure 1. The conceptual framework of TastyTalk: A Smart Voice-Assisted Cooking Guide with Ingredients Lists

The conceptual framework of the study illustrates in Figure 1 how the research would be conducted. To determine the necessary factors needed in developing the software in order to produce the intended output, from planning phase, development phase to identify the needed function, application testing to test the functionality of the application and to evaluate the acceptability and acceptance of the user towards using the application.

In planning, the researchers gather essential information related to the systems purpose, features and target users. Additionally, this includes the step of identifying the user needs in the current cooking experiences and the possible opportunities for technological enhancement.

As information and facts are synthesized, Rapid Application Development is initiated. As the information are integrated, analyzed and refined, it was then subjected for Black Box testing. Then finally, a selected number of users was asked to use the application for Acceptance Testing.

Project Purpose

The purpose of this study was to develop a mobile application that was a smart voice-assisted mobile application designed to enhance meal preparation experience through an interactive cooking guidance. The application helped the users on simplifying the cooking process by providing a step-by-step voice instructions, complete list of ingredients of each recipe, monitoring the cooking skills of users and timer alerts. The proponents chose the constituents of Nagcarlan, Laguna as their test subjects for the project to test their developed application. The study is beneficial to the researchers in gaining more knowledge and experience in developing a platform that is helpful to the community, and lastly the study was a useful reference for the researchers who would plan to make any related study, further enhancement and implementation of the project.

The following are the beneficiaries of the study:

Residents. The Residents benefited from the application as it provided them an easy and convenient voice assisted cooking guide for an easier meal preparation, as well as monitoring their cooking skill everytime they were cooking.

Researchers. The study was beneficial to the researchers in acquiring experience and better understanding in developing a system.

Laguna State Polytechnic University. The Laguna State Polytechnic University can gain benefit from this project in terms of improvement in the field of research and development.

Future Researchers. The concepts presented may be used as a reference in conducting future research related to the study.

Scope and Limitation of the Study

In this section, the researchers present the scope and limitation of their research project. This provided the coverage of their research study as well as the limitation of their project.

In this study, there were three main points focused on namely: 1.) design and development of the system 2.) system testing and 3.) user acceptance testing. The proposal has its scope and set limitations in terms of investigation, content and methodology to name a few the following are the scope of the study.

The preliminary investigation and study has led the proponents to propose the development of a smart voice assisted cooking guide application that will help improve the current meal preparation process. The preliminary investigation and study on previous papers , it has led to the specifications including features: (1) smart voice assistance, (2) monitoring of cooking skills level, (3) ingredient list, and (4) timer alerts.

The smart voice assistance will help the users to interact with the application with the use of voice recognition using certain keywords accepted by the system. In every time the user cooks, a feedback will be collected from them and this will monitor their cooking skills level if the user gets better every time they cook. The ingredient list will be shown as they browse for dishes and includes timer alerts.

The study will also cover a combination of qualitative and quantitative research methods. Acquiring qualitative data will be useful in the design and development of the system and the quantitative data will be significant in the user acceptance testing.

Yet, the study still has its own limitations namely the system will be used by selected households in selected barangays in Nagcarlan, Laguna. The system will also be limited to local and commonly cooked meals only and is using English as its default language. The study did not cover a business model for developed mobile application.

.

CHAPTER II

REVIEW OF RELATED LITERATURE

The researchers used the internet, specifically sites like Google Scholar and eric to collect useful studies and information for the development of the project. The literature listed below guided the researchers in making their project.

Voice Assisted Technology

In the study of Dela Cruz et al (2020) entitled "Talkie: An Assistive Web-based Educational Application Using Audio Files and Speech Technology for the Visually Impaired" it provides data on the development of Talkie, a web-based educational application designed for visually impaired users. Additionally, this supports the text to speech features that allows the users to interact with the system. This study supports the functionality TastyTalk will provide as the study measured the user acceptance testing, pointing out the potential of voice-based interfaces.

Another similar study was conducted that shows the potential of voice assisted interaction which was provided in the study written by Matel et .al. (2019) entitled "ECHO: Hands-Free Computer Interaction using Speech Recognition System for the Debilitated" discussed a hands free computer interaction system designed to assist users with physical disability that uses a speech recognition allowing users to control computer functions through voice commands. With the result and findings of this study indicated that high success rate in functionality testing (94.79%), stress testing (100%), and compatibility testing (100%) shows the robustness and reliability of speech recognition technology. These outcome supports the use of voice recognition feature for the tastytalk application.

Considering the design and user experience is a factor to be considered in the development of a system. In the study of Pradhan and Lazar (2020) entitled "Use of Intelligent Voice Assistants by Older Adults with Low Technology Use" provides investigation and study on how older adults with limited technology experience use voice assistants in their homes during the 3 weeks field deployment. This study supports the idea of using voice interfaces and pinpoints the importance of using an intuitive user interface which can be a consideration for the proposed TastyTalk.

Impact of ICT in Meal Preparation

In the research of Bednář et al. (2020), the problems of ICT in food processing industry were examined. They discovered that the use of ICTs has substantially improved operational efficiencies, food safety improvement, and traceability. This shows how technology can modify different stages of food preparation and processing to mainly enhance quality and avoid human error. These findings can be applied to the TastyTalk application which is designed to help users compile meals more effectively through guided, tech enhanced instructions.

Another related study was implemented by Gunawan (2022) in the study "ICT Development and Food Consumption: Affect of Online Food Delivery Services". The paper looked at the impact of the emergence of ICT platforms, including mobile apps and internet delivery systems, on how consumers eat and behave. It determined that the results and the availability brought about through such systems do contribute towards how people plan and prepare meals. TastyTalk, by providing mobile-friendly, voice-supported, cooking guide, contributes to this emerging trend by Creating hands free guided meal preparation

Solo Dining researchers (2022) in a study titled "Solo Dining at Home in the Company of ICT Devices" brought forward the study of psychological and behavioral impact of ICT devices during solo meal experiences. The results showed that solo dining was made more interesting through the use of technology as smart speakers or multimedia contents. This justifies the application of interactive voice guided experiences to increase user engagement and motivation in meal preparation, particularly for users who are cooking alone.

Based on a systematic review by [Author Unknown] (2022) "Information and Communication Technologies in Food Services and Restaurants", the paper was dedicated to the issues of ICT adoption in the professional kitchens and food-facilities. Studies indicated that there was improved efficiency, minimized waste and better management of workflow. Even though the study was centered around commercial kitchens, it gives applicable lessons that can be applied in personal use applications such as TastyTalk, where voice based instructions and smart timers can be used much the same way to optimize ones individual cooking practices.

The research "Digital Technology, Knowledge Level, and Food Safety Governance" in 2021 highlighted the increased use of ICT in facilitating food safety awareness and regulating food preparation process. The study found out that digital platforms may close knowledge gaps in correct food handling and preparation methods. TastyTalk implements this by having guided steps with voice prompts that reduce the level of risks, and which also maintain hygienic practices.

Another major study ,"Exploring the Opportunities and Challenges of ICT-Mediated Food Redistribution, (2023)" was anchored on the use of ICT platforms for wastage-free food redistribution. While it was mainly concerned with food sustainability, the technologic framework mentioned above, such as real time tracking, automated notifications, is relevant to TastyTalk's use of timers and alerts to track what is happening in the cooking process.

The ScienceDirect (2022) article called "ICT applications for food industry" researched the usage of big data, IoT and AI in food production and cooking. Such technologies have started to impact consumer-level tools also. These innovations are bolstered by TastyTalk utilizing speech technology and even smart timers to enhance the oversight of home-based meal prep.

In the study Technology Use in Food Practices During the COVID-19 Pandemic (2023) examined changes in food habits because of the high reliance on technology while in lockdowns. It discovered that people were increasingly using online recipes, virtual classes, and apps to instruct their meal preparation. TastyTalk combines voice interaction and step-by-step instruction in order to assist users in cooking with confidence.

Speech to Text/ Text to Speech

In Rantamäki & Väänänen's (2022) study on "Usability of Voice Interfaces for Cooking Guidance", the researchers identified the usability of voice interfaces in smart kitchen for the purpose of guiding users concerning the cooking process. They discovered that voice-assisted technology did not only enhance user experience but made multitasking while preparing food easier. This is consistent with the aims of the

TastyTalk application, which aims at ensuring that the users get hands-free and voice guided assistance when making food.

The other applicable study was conducted by Park and Lee (2020) under the title of "Elderly-Friendly Voice Interface Design for Recipe Support Systems" that discussed the design of voice interface for elderly users. The researchers enumerated the value of making technology accessible and intuitive, which can enhance the cooking experience of seniors. TastyTalk can adopt these design principles in order to make it usable among people of all ages including the older adults.

According to a study by Almeida, Costa, and Moreira (2023), "Evaluating Hands-Free Voice Technologies in Kitchen Task Performance", its authors evaluated the effects of the hands-free voice technologies on kitchen tasks. The results demonstrated that hands-free devices improved efficiency with less human error, which advocates for the introduction of related technologies in TastyTalk for making cooking more convenient.

One of the studies was conducted by Sarkar and Singla (2021), "Conversational Agents in Cooking: "Exploring Alexa Skills for Recipe Navigation", examined the use of Alexa in delivering real-time assistance in terms of voice-assisted recipe navigation. According to the study, the use of conversational agents meant that it was easier for users to follow a recipe without interrupting their cooking procedure. TastyTalk could do this conversational technique to offer real-time advice in cooking.

The research conducted by Kim and Yoo (2022) "Voice-Based Meal Preparation App for Visually Impaired Users" is related to how voice-based apps can help the visually impaired users in meal preparation. The importance of voice-based

interactions as a tool to enable the users to cook independently and safely was demonstrated through the study. TastyTalk can incorporate similar facilities to accommodate the persons with visual impairments.

In the research done by Farooq and Malik (2020), titled "Speech-Enabled Applications for Kitchen Safety and Efficiency", they looked into ways to use speech-enabled applications to ensure safety and efficiency in the kitchen. According to their research, applications of this sort decrease kitchen incidents as they deliver real-time, hands-free instructions. TastyTalk could adopt similar functionalities to increase the user's security during cooking.

The paper "Speech Recognition and Voice Feedback in Cooking Systems" (Lee & Hong, 2021) is a research on the usage of speech recognition in cooking systems. The researchers discovered that the use of speech recognition enabled the users to be more natural when dealing with cooking applications. The current study is relevant to TastyTalk to whom the integration of speech recognition would prove useful in facilitating voice commands to control their cooking experience.

In the paper entitled "Conversational Interfaces in Cooking Applications", Zhang, Li, and Lin (2021) investigated the use of conversational interfaces in the sphere of cooking apps. Their research found that conversational agents make cooking process more personalized and intuitive. TastyTalk might use the same interfaces to provide user with a tailored interactive cooking guide.

Cooking Skills Monitoring

In the work of Lavelle et al. (2017), titled "The development and validation of measures to assess cooking skills and food skills", the researchers created and validated

a wide-ranging collection of tools that aimed to assess a range of cooking skills and food-related competencies. The study describes essential elements which include; ingredient selection, food preparation methods, plannin C,g skills and budgeting skills, hence, offering a strong set-up on which culinary proficiency can be evaluated. These measure validations provide empirical perspectives om>? ?? supportive for TastyTalk because it provides a model for monitoring users' cooking skills. Adopting the same type of assessment tools in its system, TastyTalk would not only lead the users through the interactive voice-connected recipes but also monitor their progress and find the possible improvements, thus contributing to a better cooking process.

The other study by Adams et al. (2021) study titled "Cooking for Health" identifies bringing является. In "A Healthy Food Budgeting, Purchasing, and Cooking Skills Randomized Controlled Trial to Improve Diet Among American Indians with Type 2 Diabetes", the researchers implemented and tested an intervention to improve the cooking skills, food purchasing behaviors, and dietary habits in American Indian populations who suffer from type 2 diabetes. The research showed that organized cooking programs can yield huge improvement in nutritional intake and health outcomes. This is in alignment with the intended purpose of the TastyTalk application which is to not only help the users make meals but also bring healthier cooking practices as a guided process using voice.

Interactive Cooking Guide and Recipe Application

In the study "The Development of HomeChef: A Recipe Finder Mobile App," Hanis et al. (2023) describe how HomeChef, a recipe finder mobile app, was developed to address common problems with meal planning and preparation. The application uses

the Prototyping Model and includes modules for meal planning, recipe discovery, and ingredient management.Improved filtering and search algorithms and the use of software like Flutter and Cloud Firestore for seamless operations enhance user experience. High system efficiency during user acceptance testing ensured the feasibility of smartphone applications like TastyTalk to deliver structured, efficient, and environmentally friendly home cooking choices.

Another applicable study was carried out by Deol and Singh (2011) titled "Recipe Helper System Mobile Application with Voice Recognition", which centered on the integration of voice recognition features into a cooking assistant mobile application. The project was aimed at minimizing manual intervention in cooking by enabling users to manage and navigate recipe steps using voice commands. It has been developed in the Android operating system and from a throwaway prototyping perspective. The system has a huge collection of foreign recipes and the performance and usability were tested on it. Favorable outcomes prove the application of hands-free voice interfaces and validate the ability to use voice interaction functionality on TastyTalk to provide convenience, particularly as users are busy cooking.

In the study "What to Cook? Mobile Application," Mohamed Fazil and Halim (2021) created a mobile application that allows users to select what to cook based on what ingredients they have, their food allergies, and how much time they have to cook. The application was created using a step-by-step method and is compatible with Android phones. They can enter what ingredients they have and their dietary preferences, and the app will give them recipe suggestions. This helps people make quicker decisions about what to cook. The study suggests that apps like "TastyTalk" can promote healthy eating and food waste prevention.

A related study to this is "Cooking PaPa: An Online Application Helps Removing the Barrier Between Modern Generation and Cooking" by Khan Mohd et al. (2023). This application was developed to encourage young adults to cook more at home. It offers easy-to-follow instructions and loads of simple recipes that are ideal for novices. It became extremely popular with the COVID-19 pandemic when more people wanted cooking at home. According to the study, apps that provide a simple yet fun layout will make users more confident when using the kitchen and allow old forms of cooking habits.

Vir and Madinei (2024) developed a new cooking app on iPhones with "ARChef: An iOS-Based Augmented Reality Cooking Assistant Powered by Multimodal Gemini LLM." The app utilizes AR and a sophisticated AI model to recognize ingredients from the phone's camera view and provide recipes along with nutrition information. Utilizing Apple's AR technology, the application presents interactive cooking steps on the screen itself. Surveys revealed that ARChef helps people to organize meals better and waste less food, proving that AR technology has the potential to make cooking easier and more fun.

Another example is "Feast," a recipe app launched by The Guardian in 2024. It holds thousands of recipes, including quick dishes, vegan recipes, and chef-produced content. It possesses a "Cook Mode" to guide users through step by step and a search function based on intelligence to search for recipes either by ingredients or dish. It was designed carefully with organized recipe data to maintain simplicity of use. Not only did this add to user comfort, but also helped The Guardian's website welcome more visitors.

Timers in Cooking

In a study by Voit et al. (2021) entitled "The Attention Kitchen: Comparing Modalities for Smart Home Notifications in a Cooking Scenario", it highlights the influence of different types of notifications—On-Object, ambient On-Environment, and On-Smartphone—on user attention during cooking activities. In Voit et al. (2021) research paper entitled "The Attention Kitchen: Comparing Modalities for Smart Home Notifications in a Cooking Scenario," it discusses how different types of notifications—On-Object, ambient On-Environment, and On-Smartphone—affect the attention of users while engaged in cooking processes. Having 24 participants, the findings concluded that ambient On-Environment notifications were least intrusive and allowed users to perform their core activities with greater efficiency. The research verifies the dimension of this capability that TastyTalk plans to deliver by means of non-intrusive intelligent timer prompts and context-aware alerts that drive user concentration, eliminate mental burdens, and facilitate more efficient cooking.

The Smart Kitchen Technology (2023) study is another study that analyzes the use of a smart kitchen prototype that holds intelligent systems in an effort to enhance efficiency, convenience, and safety during cooking. This study shows how alert systems, automated timers, and real-time interaction of the user with the cooking environment can reform the process of cooking.The prototype test data and user feedback show evident acceptance and potential for the use of these technologies to furthe direct and responsive cooking support systems. These results support the use of smart timers and alert capability that TastyTalk will offer, ultimately enhancing overall cooking performance and user satisfaction.

In the paper "Development of an Arduino Based Electric Cooker Timer System", Oyedeji et al. (2020) designed a timer system for electric cookers with an Arduino microcontroller. The system permits the user to set the cooking time via a keypad. After the passed time, the cooker shuts down automatically, preventing overcooking and accidents. The device also has an LCD display to indicate the countdown as well as a buzzer to notify the user when cooking is complete. This ensures that cooking becomes easier and safer, particularly for busy individuals or those who tend to forget to switch off the cooker. The research demonstrates how technology can be employed to minimize human error in the kitchen as well as save energy.

Another similar study is "A Case Study of On-Screen Prototypes and Usability Evaluation of a Cooker Timer and Food Menu System" in the International Journal of Human-Computer Interaction. The study was about developing and testing a prototype of a basic digital cooker timer and recipe menu. The study found that when the interface is clear and simple, people can use it more easily, even if they are not good with technology. For example, buttons were labeled with everyday words, and icons were easy to understand. This kind of user-friendly design is especially helpful for older adults or users with less experience in using digital devices. The research stresses the significance of developing apps which are both usable and functional.

The research "The Stove Timer as a Device for Older Adults with Cognitive Impairments" considered how stove timers can assist aged individuals who cannot remember things or focus. These timers can prevent kitchen fires or burnt meals by either warning the user or shutting off the stove when the timer expires. This device facilitates easy cooking for seniors independently and safely. The researchers discovered that assistive devices such as this can significantly enhance the quality of

life for older people. It demonstrates the impact of clever application of common technology in providing simpler tasks of people who need assistance.

In research "Tablet-based Knife-control Support System for Cookery Beginners", specifically with the help of individuals inexperienced at cooking. The application presents lines of cuts on a screen of a tablet to instruct a person on appropriate cutting and also to ensure his/her safety during this process. The aim of this app is to guide beginners into mastering knife skills and preventing injuries. It is particularly helpful for the younger generation or new cooks. The researchers discovered that the users became more confident and could follow recipes better. This indicates how even simple kitchen skills could be enhanced using useful digital aids.

Recipe Mobile App

In the study "Recipe and Meal Management Mobile Application for Willieanne.nl," Blaas, R.M. (2019) examined how a mobile app can support women aged between 40 and 60 years to manage meals and recipes in order to improve menopausal well-being. The study focused on relieving symptoms like fatigue, joint discomfort, and mood changes through diet. A prototype app was developed, tested, and refined to fulfill users' needs. The research showed how a well-designed app can foster health by encouraging structured meal planning. This is instructive for TastyTalk's design, as it shows how mobile technology can offer health-focused recipe management for specific user groups.

But another relevant research, "Service-oriented Multi-platform for Food Computing: A Mobile Application for Recipe Adaptation to Nutrition Behaviours (AI2Cuisine)," talks about a recipe application that adapts food based on individual preference, medical requirements, and sustainable demands. Intelligent algorithms and

a wide array of sources of food information are used in tailoring the recommendations of recipes. This conforms to the TastyTalk vision of providing customized cooking suggestions and recipe filtering based on nutrition for improving the user experience.

Through the research "Ingredients Recipe Application," developers created a mobile application that allows users to view recipes with pictures, ingredients, cooking steps, and references to videos. It was created for busy parents and beginners and was especially useful during the COVID-19 pandemic when individuals started cooking more at home. Following the ADDIE model (Analyze, Design, Develop, Implement, Evaluate), the app is simple and functional. These qualities support the ease of use goals of TastyTalk, such that users can easily navigate and use recipes by taste, time, and cooking skill.

The study "The Development of e-Recipes Mobile Application with Text Recognition: Recipes Collector" built a mobile application that uses OCR (Optical Character Recognition) to identify and organize recipes from images or screenshots. It has recipe collection, categorization, and shopping list features, with cloud storage. The application had very good user satisfaction while it was being tested, which means that it was functioning and easy to use. All of these tasks are complementary to TastyTalk because they describe how taking recipes and smart storage can help consumers collect and manage meal ideas from different places.

Enhancing Cooking Skills Through ICT

The following research paper entitled "Learning Material in the Culinary Arts Program: "Utilises the Flipbook Application to Create Accessible Teaching Learning Material for Culinary Education," the researchers stipulated that flipbook applications

may be used to create interactive and accessible teaching materials in culinary. This research will help the development of TastyTalk as it shows how digital technologies can be incorporated in the culinary arts for highly effective learning experiences, especially when accessibility and technology are given focus.

Moore et al. (2021) conducted their research "Transformational Game Trial in Nutrition Education" on the use of the transformational game to engage young people on improved food choices. This research shows that interactive technology has huge potential to affect dietary habits and this goes with TastyTalk's objective of giving its users an interactive and interactive cooking experience for a purpose of making their food choices and skills better.

In the study "Blended Distance Learning in Cookery" (2020), blended learning approaches were tested in terms of efficacy for teaching the cookery skills. The study revealed that, both in practical cooking applications and student engagement, online learning combined with practical applications improved skill retention. This supports the need for TastyTalk to utilize hybrid learning methods where digital instructions meet hands-on, guided cooking via voice commands in order to facilitate development of skills in cooking.

In their study Digital Pedagogy in Culinary Arts: ' Development of an ICT-based Educational Information System for High School Culinary Students," searched the ways how ICT-based systems can be effective and accessible for teaching culinary arts. This research confirms TastyTalk's desire to bring a digital product that provides real-time voice-guided cooking help that would help improve learning process for users at home.

Another research "Augmented Reality in food preparation training" (2022) discusses the incorporation of AR technology in training teachers in food preparation and production subjects. From the findings, it is indicated that AR enhances training engagement and skills mastery. On the same note, augmented reality components can be used by the TastyTalk to provide better visual experience and take users through the step-by-step cooking experience in an immersive way.

In an article titled "Interactive Live Online Cooking Program" (2021), the researchers conducted a study to determine the effects of live online cooking classes among children belonging to vulnerable families. From this study, it was observed that interactive and live cooking classes helped enhance cooking skills and nutrition. This supports the TastyTalk vision of providing real-time interactive instructions and advice on how to cook and guide users particularly vulnerable groups to get the best out of their cooking.

The article "Meta-Analysis of the Influence of Social Media on Students' Cooking Skills" (2021) looked at the influence of social media platforms on the cooking skills for students, especially when in pastry and bakery. It concluded that social media helped a lot in terms of skill development since it enabled them to access various cooking methods and to get feedback from people. This revelation supports the fact that TastyTalk has integrated digital platforms to provide voice-directed learning to inspire the users to acquire culinary skills.

In the article "Video Technology" on Learning, the author addresses the issue of the video technology effect on the learning process. A Cooking Skills Experiment"

(2022), the experiment reviewed the potential of video technology in assisting individuals with low skills to attain proficiency in cooking. The findings showed that video-based tutorials coupled with practical cooking experience were helpful to enhance cooking competence. This augments TastyTalk's multimedia methods by combining voice, timers, and visual response to lead users to the cooking procedure.

Rapid Application Development Methodology

In the study of Fauzi et. al. (2023) entitled "Systematic Literature Reviews on Rapid Application Development Information System" shows that Rapid Applications Development (RAD) is a quick development cycles and iterative prototyping taht allows for more flexible and responsive system creation. This principle can be applied to TastyTalk application ensuring that the result will be aligned with user preferences and requirements.

Using RAD methodology in systems development, finish this. According to the study entitled "Implementation of Rapid Application Development (RAD) Method for Mobile-Based Ice Cream Ordering Application " of Bahari and Pramudwiatmoko (2025), wherein the researchers uses RAD approach including stages like analysis, system design, application development using Kotlin and the testing phase. In the mentioned study, they found it effective as they achieved a full functional and gets over 95% of their users' satisfaction.

There were different system development life cycle methodologies and in the study of Oluyomi, Olorunshola and Irhebhude (2020) entitled "Comparative Analysis of Structured System Development Life Cycle Methodologies: Rapid Application Development, Prototyping, and Scrum" mentioning that prototyping involves building

a quick, rough version of the system to demonstrate functionality, Scrum which is an agile framework where work is divided into short sprints while RAD focuses on speed and flexibility and uses iterative prototyping, where the product is improved through several cycles of feedback and adjustment. These comparison highlighted the advantage use of RAD for the development so software applications.

Synthesis

The synthesis would summarize the key themes discussed in the related literature, aiding the researchers in identifying, understanding, and finding solutions. Moreover, the commonalities, differences, and patterns observed across these studies create a foundation for future research that could contribute to the development of TastyTalk application.

This literature discusses the importance and advantages of systems integrated with voice-assisted technologies aiming to enhance the user experience, efficiency and user experience. In the study conducted by Dela Cruz et al. and Matel et al. provides the background stating the reliability and acceptance of voice interfaces among users which is the core feature integrated with TastyTalk. Additionally, these studies pointed out the robustness and functional reliability of systems integrated with voice-assistance.

TastyTalk aims to contribute and help its users in their meal preparation using ICT applications. This was supported with the study on the growing role od ICT in food practices by Bednář et al. (2020) and Gunawan (2022) showing that technology enhance efficiency and influences the meal planning behavior may change in food preparation under industrial and/or household levels. This was supported by the study of Rantamäki

and Väänänen (2022) shows that systems integrated with multitasking and usability in the kitchen which is aligned with the goal of TastyTalk.

The mentioned studies and reviewed related literature indicates and supports the study of TastyTalk with the integration of voice- guided assistance, intuitive design and ICT driven features in meal preparation tools. This also shows the current technological trends and userneed that can be seen with TastyTalk and the mentioned studies may guide the researchers on the project development and improve the cooking experience of its users.

CHAPTER III

RESEARCH METHODOLOGY

This chapter includes the research design, the population of the study and locale, sampling design, data collection instruments, validation of questionnaire, statistical treatment, and project design, project design, and Software Development model, this is the researcher's step-by-step approach. It also includes the testing and evaluation, which is used to meet the study objectives.

Research Design

In this study, the researchers used descriptive and developmental research methods. The descriptive search was done when the researcher conducted an interview with residents of Nagcarlan, Laguna to gather information that would help in the development of the project. The descriptive design is also used to answer questions and the purpose of the study. The developmental research was used to help the residents of Nagcarlan, Laguna and identify the features and functions that are important to identify the problems during the descriptive research process.

According to Mete J., et al. (2023) descriptive research is an important approach that analyzes a study problem using both qualitative and quantitative methods. To find characteristics, patterns, correlations, and classifications, it employs surveys, interviews, and other techniques. Improving the researcher's abilities and knowledge base is the goal.

According to Reeves, T.C. (2000) developmental research is a systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet specific criteria of internal consistency and effectiveness. It is

often used in fields where innovation and practical application of theories are essential—such as education and software development.

With the help of these two research methods the researchers can determine the best way to gather information and formulate a solution to the problem of the system same to the development of the research

Locale of the Study

This section shows the locale of the study, which is focused on the households residing within the locale of the study, Nagcarlan, Laguna. The researchers extracted a sample size of 378 respondents from the total population to test the user acceptance evaluation and application testing. The researchers focus on the household per street to execute the given testing and evaluation procedure. The next table shows the target population, the accessible population of the respondents, and the sample size.

Population of the Study

The researchers coordinated with their statistician, Mr. Victor A. Estalilla Jr., to help them get the target population and what sampling design is usable for their study, and to get the sample size they need. Mr. Estalilla Jr. suggested that the researcher must get the total population per household and use purposive sampling and pick specific barangay of the chosen locale. During the consultation, Mr. Estalilla Jr. explained to the researchers how to compute and get the sample size.

Table 1. Population of the Study

RESPONDENTS	POPULATION	SAMPLE SIZE	PERCENTAGE
Brgy. Balimbing	153	31	8.20%
Bukal	280	55	14.55 %
Kanluran Lazaan	214	43	11.38%
Malinao	448	90	23.80%
Oples	148	30	7.94%
Silangang Lazaan	413	83	23.85%
Sinipian	235	47	12.43
	1891	378	100.00%

Proportional allocation method taWAG DYAN

Table 1 shows the respondents of the study that are selected by the researchers using purposive sampling. The total number of populations per household in selected barangays in Nagcarlan, Laguna is 1891. The proponents consulted their statistician in order to get the sample size. From the total of 1891, the proponents come by 20% from the total population per household and came up with 378 as the sample size.

Tester Profile

The researchers invited five (5) credible system evaluators to assess the performance and functionality of the developed TastyTalk: A Smart Voice-Assisted Cooking Guide with Ingredients Lists

Table 2. Testers Name and Credentials

SYSTEM EVALUATOR	NAME	CREDENTIALS
1	John Philip Dorado	Graduated Bachelor of Science in Computer Science and currently an individual contributor at Intelimina Systems Inc. and Loudcloud Inc., Quezon City
2		
3		

The table 2 shows tester name and credentials, which were important to determine their capability to evaluate the performance and functionalities of the application developed.

Sampling Design

A purposive sample, also referred to as a judgmental or expert sample, is a type of nonprobability sample. The main objective of a purposive sample is to produce a sample that can be logically assumed to be representative of the population. This is often accomplished by applying expert knowledge of the population to select in a nonrandom manner a sample of elements that represents a cross-section of the population (Lavrakas, 2008).

The researchers used purposive sampling in choosing the respondents for the study. The target respondents were divided by households in different selected barangays in Nagcarlan, Laguna.

Data Collection Instrument

The researcher used different kinds of methods of gathering information for the said project. It helped the researchers gain possible solutions to the problem through interview, observation, questionnaire and other gathering instruments. The following methods were enumerated below.

Observations

Through observation and experience on the problems, the researcher encountered regarding daily meal preparation in the chosen locale. The researcher visualized and planned a solution to solve the problem.

Interview

 The researchers conduct an interview to learn and collect more information about gregg shorthand stenography. The researchers conducted an interview with Ms. Ethelmay R. Romero, the former educator of stenography in BS in Office Administration at Laguna State Polytechnic University and now currently a program coordinator in BSOA.

 In the study of Taherdoost H (2022) one of the most effective methods for gathering qualitative data is through interviews, which allow the researcher and the interviewer to create a line of communication. In-person, over the phone, or online, researchers attempt to comprehend and investigate respondents' beliefs and actions regarding a particular topic. Even though conducting interviews is crucial for gathering data for research studies, designing an efficient interview that yields fair, sufficient, and precise data can be difficult. This article outlines the standard procedures for creating and carrying out efficient interviews as well as the primary ethical concerns that participants, interviewers, and researchers should keep in mind when conducting interviews for a study.

With the help of Ms. Luz Espino, RND, President, Nutribest Foods Inc., the researchers discussed the current process of their topic and its problem, along with it is the opinion of Ms. Espino about the project that the researcher proposed. The researcher reached out using "Messenger" as a medium of communication.

Online Research

 The internet made a great contribution in providing information about the researcher's study. The researchers use the internet to find more reliable information, concepts, and ideas to help the researchers in the development of the mobile application.

The internet provides different kinds of articles and journals that are published and related to the study to help in proving the state of the researcher's study.

According to Campbell L. (2021) selection bias can take many different forms in online research, such as self-selection bias, non-response bias, or targeting only particular categories. When rating scales are used, they must be contextually validated and meet psychometrical requirements including validity, reliability, and setting invariance for cross-national comparisons.

Rodríguez-Díaz M. a gap analysis is performed to define the key aspects that must be managed in order to create and maintain a powerful reputation and image in the companies' communication. Since this subject is too complex to be implemented in distinct sectors and ambits, different lines of research are proposed to expand this new critical line of study.

Researchers used the common way to gather information for their project to acquire some possible functions and features in order to get an idea on how they will design and develop their project. With the help of online research, the researchers were guided with some ideas and concepts as well as suggestions on how their project should be created.

Project Design

This section explains the software method utilized by the researchers to conduct the research. It also shows how the study was carried out. This served as the foundation for deciding if the project was useful and important. This demonstrated the clear intent and high success rate of the designed application. The project design allowed the researchers to assess if the application satisfies the demands of their respondents.

In the study of Mosquera-Guerrero A., et al (2023) in order to ensure project success and the accomplishment of the intended objectives, indigenous communities must design their projects with social capital, community participation, social innovation, and multigenerational understanding of the relationships between people, products, and ecosystems in mind. Furthermore, the process' applicability is recognized by appreciating the unique characteristics of the Indigenous populace, a move that references ideas like indigenous planning—a crucial component of project design.

The researchers discussed the system development methodology that they used for their project. It explained how they develop their project through the use of Rapid Application Development (RAD) methodology, NIX Solutions. (2021, January 27).

Software Development Model

In this project, the researchers used the Agile model in developing the StenoFied: Stenography Application for Students of Bachelor of Science in Office Administration at LSPU - SCC with Voice recognition and Translation

The most crucial step in the software development life cycle is software development project management. Initiating, Planning, Executing, Monitoring and Controlling, and Closing are the phases of project development. Chasanah N., et al (2023)

The researchers used the Rapid Application Development Model as the software process model in the development of the system. RAD prioritized rapid prototyping and quick feedback over long drawn out development and testing cycles. Developers can make several changes or iterations and upgrades to software without having to start

a development schedule from scratch each time. This approach enabled researchers to respond quickly to the project's changing requirements Cepero (2019),
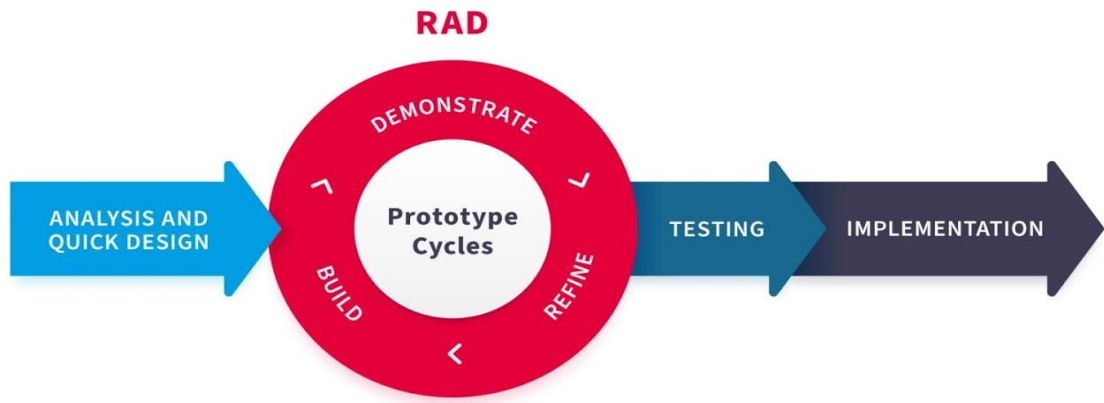

Figure 2: Rapid Application Developent methodology

The figure above depicts the methodology used by the researchers in developing the mobile application. It illustrated how the system was developed. It consisted of analysis and quick design, prototype cycle, testing, and implementation.

Analysis and Quick Design

In this first phase, the researchers used the gathered data in the preliminary survey to make up a solution for their proposed project and made a quick design, and developed the application to know the possible functions and features of the said application.

Prototype Cycles

Second phase is the development stage of the application, at this point the researchers improved their quick application design and development of the said application.

Build - The build part is the starting point of coding and designing the said project and will go into cycle "build-demonstrate-refine". The researchers used their gathered data to start developing the application.

Demonstrate - The researchers demonstrated the application to their subject expert, subject adviser and some IT expert to obtain feedback and suggestions that might need to improve in their current project. The researchers conducted consultation with their subject specialist and research adviser to demonstrate the progress on their application.

Refine - The researchers took the feedback from the experts and know what must improve to the said application and again go to the build phase. After the demonstration, the proponents gather the feedback and suggestion and use it to refine their application.

Testing

The testing phase is where the researchers consulted again with IT experts with other couple of specialists, in order to meet the requirements from the previous feedback on the second phase of developing the application. The new functions and features was tested and reviewed again.

Implementation

The implementation phase of the software development cycle where in the developed application was introduced to the locale of their study. The user or tester handed out with some questionnaire for testing of the system and user acceptability.

Testing and Evaluation Procedure

The researchers used two evaluation procedures in order to ensure the quality of the develop application. The testing was used to test the functions and features of the application through the use of black box testing. The evaluation is for the user acceptances of the application through the use of Technology Acceptance Questionnaire.

Testing

Testing Tool - Application Testing: The researchers used black box testing as a testing method in which the functionalities of software applications are tested without having knowledge of internal code structure, implementation details and internal paths. Black Box Testing mainly focuses on input and output of software applications and it is entirely based on software requirements and specifications. It is also known as Behavioral Testing.

Requirments and
Specification

Input
Values

Black Box
Testing

Output

Test Cases
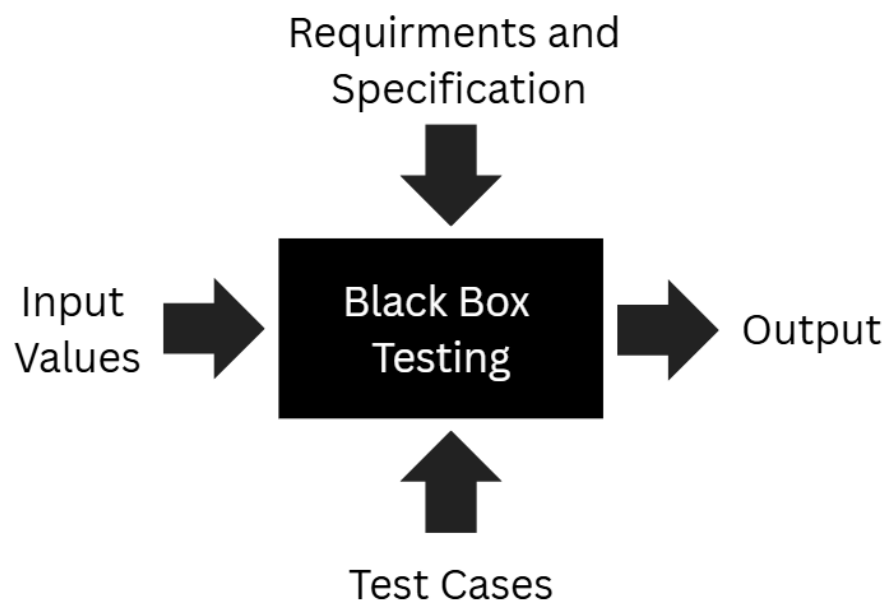
Figure 5. Black Box Testing.

The figure above represents the tool used by the proponents in testing the application. It shows how black box testing works. It is a software testing method in which the functionalities of software applications are tested without having knowledge of internal code structure, implementation details and internal paths. This is not required. With this kind of testing, testers do not need nor required to have knowledge, programming or IT skills. It also has low chance of false positives but of course, this kind of testing has its drawbacks. It is difficult to automate and if it fails, it can be difficult to understand the root cause of the issue, Still, Black Box Testing is more credible in the proponents' choice of experiment.

Testing Method - The researchers needed to acquire five (5) IT Specialist to test the functions and features of the application. These expert or specialists evaluate the develop application to ensure its reliability and credibility. The researchers also created a questionnaire for the black box testing that consist of step number, step details, expected result and other several procedures. Below is the sample of the constructed testing questionnaire for the developed application, with the step numbers, step details and the expected result of the given steps. Sample content of the testing sheets that was distributed to the IT experts were shown below.

System Architecture

The system architecture is a conceptual model that illustrates the behavior, functionality, structure, and etc. A system architecture, often known as system design, is the process of defining a system's architecture, components, and interfaces. Architectural design is a design methodology that explains the application's various perspectives, models, behaviors, and basic framework. (Coleman 2022)
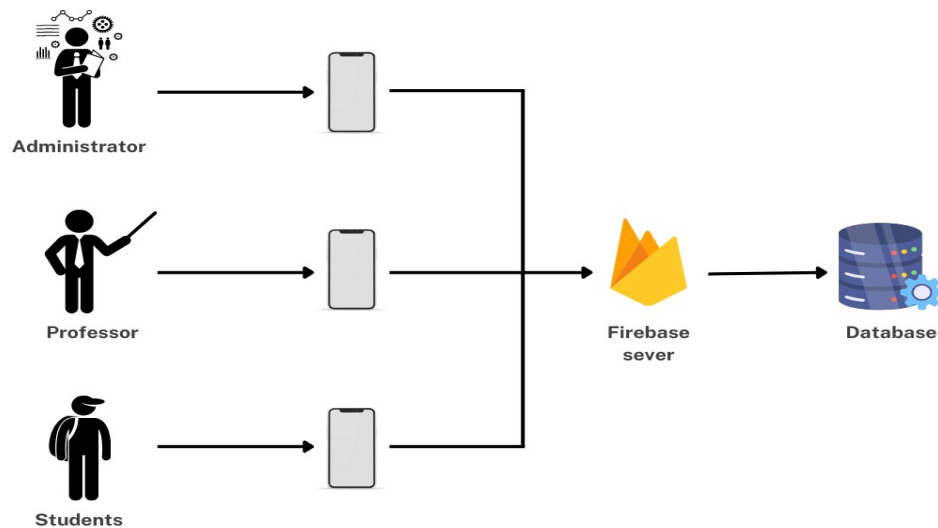
Figure 3: *System Architecture*

The Figure 3 shows that the application has three user accounts, the Administrator, the professor, and the students. These three users have different interfaces nevertheless these three users used the same database. The researchers use

Firebase for database management.

System Testing and Evaluation Procedure

The developed application is undergoing testing and evaluation in order to improve the quality of each function and feature so that a high-quality output may be produced. The researchers would use simulation testing and black box testing as testing tools to evaluate the developed application's function in order to demonstrate that it is developed successfully.

System Testing

The testing procedure is carried out to evaluate the application's functionality in view of the actual test input gathered by the researchers.

In order to make sure software serves the intended purpose, software testing is an essential step in the software development lifecycle. Selecting the appropriate

approach is crucial for effectiveness and achievement. A thorough analysis of software testing methodologies, including classifications, stages, and approaches, is presented in this paper. Additionally, it addresses the connection between validation and verification, elucidating the distinctions between the two and their significance for software quality. Umar M. A. (2019)

To evaluate the efficiency and effectiveness of the developed application, the researchers took the following steps:

a. The Design and Development of Testing Tool

b. The Testing Method

Testing Tool

The testing tool is significant, it was used to evaluate the performance and the functionality of the developed application. The researchers used the black box testing to check the validity of developed mobile application's functionality and performance.

As stated by Agus I. et al (2024), using functional tests and usage scenarios, the black box testing technique makes it possible to assess system performance. The test findings underline a number of system performance-related factors and point out troublesome areas that may benefit from change.
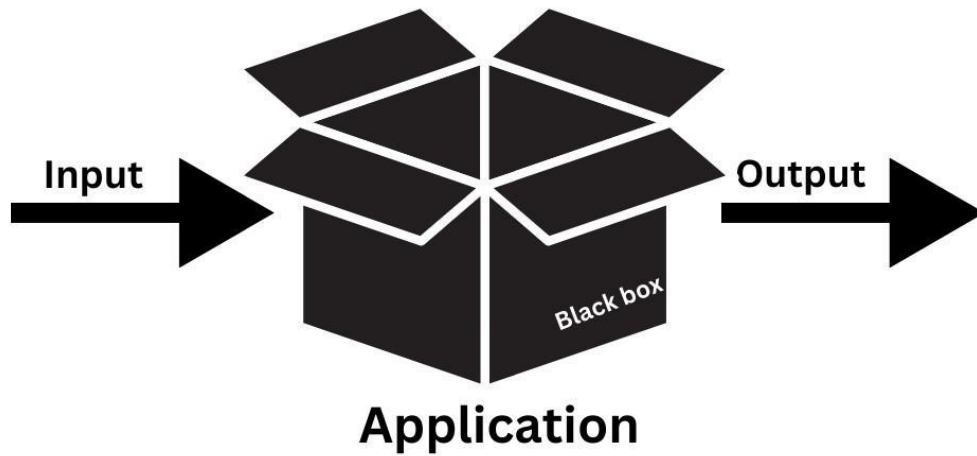
Figure 4: *Black Box Testing.*

The figure 4 shows the black box testing. Black box testing involves evaluating without knowing how it works within, where the tester inputs data and checks the output produced by the system being tested. The developed application was assessed by the researchers using black box testing, a reliable method for analyzing an application from the perspective of the users. This testing technique focused on examining the software's

input and output to ensure that no external variables were affecting the application functionality causing it to malfunction.

Though the students are the primary users who interact with the application, the administrator is the one who manages the students and professor account, the administrator has the capability to remove the account and at the same time verify the user account. The professor has the capabilities to check the student quizzes and activity to ensure the accuracy of the steno that students answer. The students have the capabilities to view the lesson, take the quizzes and activity, use the steno translator and voice recognition, and are able to use the notepad that the application provides.

Therefore, the researchers created a questionnaire to evaluate the performance of the developed application during testing, using feedback from the IT Experts. The questionnaire included the results of the application testing process.

The table below shows the testing sheet which consists of the step number, the step details, and the expected results.

A. Stenofied mobile application test sheet statement for the students Table

3. Test Case for Students User: Account Registration

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Open the mobile application	last name, and upload COR.
2	Click the **"Sign up"** button.	5 Tap the **"Register"** button.
		Mobile application open. Display the information needed to fill up.
3	Select the user type.	Display if the user is a professor or student.
4	Input email, password, first name,	Inputted needed information displayed correctly.

Not all needed information fields are filled, a snackbar message would appear indicating, –	Please fill up all given fields.
	All input fields are filled, a snackbar message would appear indicating, – Successfully registered new user. It would go back to the log-in page.

The table 3 shows the initial appearance of the testing tool that is intended for the students. It shows the step-by-step process of registration of an account with step number, step details, and the expected results of the steps. The measuring statement identifiers above were the actual statements used during the conducted test.

Table 4. Test Case for Students User: Forgot Password

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click **"Forgot Password".**	Display the email, and the password was be encrypted.
2	Input email address.	The entered email would be displayed
3	Click the **"Send password.**	
	Reset Password" button.	A link would send to the used 4
	Click the **"Link".** email. 5	Enter a new password.
6		Click the **"Save"** button. Divert to reset the password. Display the new password Successfully change the account password, it can now log in with the new password.

The table 4 shows the initial appearance of the testing tool that is intended for the students. It shows the step-by-step process of forgetting the password with step number, step details, and the expected results of the steps. The measuring statement identifiers above were the actual statements used during the conducted test.

Table 5. Test Case for Student User: Login

	STEP DETAILS	EXPECTED RESULT
	Input email and password. password was encrypted up.	Display the email, and the
2	Click the **"Eye Icon".**	The inputted password can be displayed or concealed.
3	Click the **"Login"** button.	It would direct to the home page.

The table 5 shows the initial appearance of the testing tool that is intended for the students. It shows the step-by-step process of login with step number, step details, and the expected results of the steps. The measuring statement identifiers above were the actual statements used during the conducted test.

Table 6. Test Case for Student User: Home page

STEP NO.	STEP DETAILS		EXPECTED RESULT
1	Login to the home page.	8	Click the **"Ok"** button.
		9	Click the **"Your current exercise"** display.
2	Click the **"Your current lesson"** display.		
3	Click the **">"** button.	10	Slide the **"Pen adjustment"** slider.
4	Click the **"<"** button.		The lesson, exercise, and quiz would display. The pdf lesson was shown.
5	Click the **">|"** button.		
6	Click the **"|<"** button.		Display the next page of the pdf lesson. Display the previous page of the pdf lesson.
7	Click the **"Page picker"** icon.		Display the last page of the pdf lesson. Display the first page of the pdf lesson. Display all pages of the pdf lesson, it can scroll to choose a page. The chosen page

was shown. The current exercise, the word adjustment. Display the thickness of the
would be trace, tracing board, and the pen pen.

11	Click the **"Reset trace"**	The traced word would be button deleted and start all over again. Thus, without any tracing input a sneak bar message would appear indicating, - you have not yet . traced this word.
12	Click the **"Next"** button.	The other trace word and tracing board was shown.
13	Click the **"Previous"** button.	Display the past word traced.
14	Click the **"Submit"** button.	Display the tracing exercises page and a sneak bar message appeared indicating, - Successfully submitted this tracing exercise.
15	Click the **"Your current** display.	Display the current quiz, given **quiz"** word, white board, and the pen adjustment.
16	Slide the **"Pen adjustment"** slider.	Display the thickness of the pen.
17	Click the **"Reset shorthand"** button	The shorthand word was deleted and start all over again. Thus, without any tracing input a sneak bar message appeared indicating, - you have not yet written this word.
18	Click the **"Next"** button.	The other shorthand word and white board was shown.
19	Click the **"Previous"** button.	Display the past word shorthand. 20 Click the **"Submit"** button. Display the Stenography quizzes page and a sneak bar message appeared indicating, - Successfully submitted this quiz.

The table 6 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the home page of the students, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 7. Test Case for Student User: Stenography lessons

	STEP DETAILS	EXPECTED RESULT
	Click the **"Lessons"** button at the navigation bar.	Display the whole stenography lessons.
2	Click the opened lesson.	Display the pdf lesson. Thus, the other lesson can't be open without taking the lesson, exercise, and quiz.
3	Click the **">"** button.	Display the next page of the pdf lesson.
4	Click the **"<"** button.	Display the previous page of the pdf lesson.
5	Click the **">|"** button.	Display the last page of the pdf lesson.
6	Click the **"|<"** button.	Display the first page of the pdf lesson.
7	Click the **"Page picker"** icon.	Display all pages of the pdf lesson, it can scroll to choose a page.
8	Click the **"Ok"** button.	The chosen page was shown.

The table 7 shows the initial look of the assessment instrument as it would be utilized by students. It illustrates the precise procedures used on the students' stenography lesson, including the amounts of steps, comprehensive details, and anticipated outcomes. The actual statements recognized by this already measuring statement identifiers were used to administer the exam.

Table 8. Test Case for Student User: Tracing exercises

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"Exercises"** button at the navigation bar.	Display the whole tracing exercises.
2	Click the opened tracing exercise.	Display the exercise number, total average of accuracy, date answered, and the professor's feedback.

3	Click the steno picture.	Display the full view of the steno picture.
4	Click the **"Close"** button.	The steno picture would close.

The table 8 shows the initial appearance of the testing tool that is intended for the students. It shows the step-by-step process of tracing exercise with step number, step details, and the expected results of the steps. The measuring statement identifiers above were the actual statements used during the conducted test.

Table 9. Test Case for Student User: Stenography quizzes

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"Quizzes"** button at the navigation bar.	Display the whole stenography quizzes.
2	Click the opened stenography quizzes.	Display the quiz number, total average of accuracy, date answered, elapsed time, and the professor's feedback.
3	Click the steno picture.	Display the full view of the steno picture.
4	Click the **"Close"** button.	The steno picture would close.

The table 9 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the stenography quizzes of the students, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 10. Test Case for Student User: My notes

	STEP DETAILS	EXPECTED RESULT
	Click the "**Notes**" button at navigation bar.	Display my notes page.
2	Click the "**+**" button.	Display the box title, notepad, and voice recognition.
3	Input title in the box.	The title was shown.
4	Click the notepad.	The keyboard was displayed.
5	Input the content in the notepad.	The content was shown.
6	Click the "**Translation**" icon.	Display the translated content.
7	Click the "**Microphone**" icon.	Display transcribes voices.
8	Click the "**Camera**" icon.	Open the camera.
9	Take a picture.	Display the picture.
10	Click the "**Retry**" button.	Retake photo.
11	Click the "**Ok**" button.	Display the text in the notepad.
12	Click the "**Pen**" icon.	Display the new notes in my notes page, and a sneak bar message appeared indicating, - Successfully created new note.

The table 10 shows the initial look of the assessment instrument as it would be utilized by students. It illustrates the precise procedures used on the students' My notes, including the amounts of steps, comprehensive details, and anticipated outcomes. The actual statements recognized by this already measuring statement identifiers were used to administer the exam.

Table 11. Test Case for Student User: Translator

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the "**Translate**" button at the navigation bar.	Display longhand and shorthand translator.
2	Input the content in the first box.	Display the translated content in the second box below.

The table 11 shows the initial appearance of the testing tool that is intended for the students. It shows the step-by-step process of the translator with step number, step details, and the expected results of the steps. The measuring statement identifiers above were the actual statements used during the conducted test.

Table 12. Test Case for Student User: Edit Profile

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the Profile button/icon.	Display the profile picture, first name, last name, and **"save changes"** button.
2	Click the **"Camera Icon".**	Display the device's photos.
3	Click the chosen photo.	The selected photo was display Display the first name and last
4	Input new first and last name.	name. Display the edited profile.
5	Click **"Save changes"** button	

The table 12 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the edit profile of the students, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 13. Test Case for Student User: Frequently Asked Questions

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the FAQ button/icon.	Display the frequently asked question and page number.
2	Click the **"Next (>)"** button.	Display the next page of the FAQ.
3	Click the **"Back (<)"** button.	Display the previous page of the FAQ.

The table 13 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the Frequently Asked Questions of the students, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 14. Test Case for Student User: Logout

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"Logout"** button at the navigation bar.	Display login page.

The table 14 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the logout of the students, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

B. Stenofied mobile application test sheet for Professor

Table 15. Test Case for Professor User: Account Registration

STEP NO.	STEP DETAILS	STEP NO.	EXPECTED RESULT
1	Open the mobile application	3	Select the user type.
2	Click the **"Sign up"** button.	4	Input email, password, first name, last name, and upload

	Class Schedule.	Inputted needed information displayed correctly.
5	Tap the **"Register"** button.	
Mobile application open. Display the information needed to fill up. Display if the user is a professor or student.		Not all needed information fields

are filled, a snackbar message appeared indicating, – Please fill up all given fields.
All input fields are filled, a snackbar message appeared indicating, – Successfully registered new user. It would go back to the log-in page.

The table 15 shows the initial appearance of the testing tool that is intended for the professors. It shows the step-by-step process of registration of an account with step number, step details, and the expected results of the steps.

Table 16. Test Case for Professor User: Forgot Password

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click **"Forgot Password".**	Display the email, and the password was encrypted.
2	Input email address.	The entered email was displayed.
3	Click the **"Send password Reset Password"** button	A link was sent to the used email. Divert to reset the password.
4	Click the **"Link".**	Display the new password.
5	Enter a new password.	Successfully change the account
6	Click the **"Save"** button.	password, it can now log in with the new password.

The table 16 shows the initial appearance of the testing tool that is intended for the professors. It shows the step-by-step process of forget password with step number, step details, and the expected results of the steps.

Table 17. Test Case for Professor User: Login

	STEP DETAILS	EXPECTED RESULT
1	Input email and password.	Display the email, and the password was encrypted. up.
2	Click the **"Eye Icon"**.	The inputted password can be displayed or concealed.
3	Click the **"LogIn"** button.	It would direct to the home page.

The table 17 shows the initial appearance of the testing tool that is intended for the professors. It shows the step-by-step process of student login with step number, step details, and the expected results of the steps.

Table 18. Test Case for Professor User: Home page

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"Ungraded exercises"** displayed.	Display the taken exercises.
2	Slide the **"Percentage slider".**	Display the percentage accuracy of exercises.
3	Click the **"Next"** button.	Display the next exercises needed to check.
4	Click the **"Previous"** button.	Display the checked exercises.
5	Input "**Feedback".**	Display the professor's feedback inside the box below.
6	Click the **"Submit"** button.	Display the homepage and a sneak bar message would show indicating, - successfully graded this exercise submission.

7	Click the **"Ungraded Quiz"** displayed.	Display the taken quiz.
8	Slide the **"Percentage slider".**	Display the percentage accuracy of quizzes.
9	Click the **"Next"** button.	Display the next exercises needed to check.
10	Click the **"Previous"** button.	Display the checked exercises.
11	Click the **"Submit"** button.	Display the homepage and a sneak bar message would show indicating, - successfully graded this quiz submission.

The table 18 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the home page of the professor, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 19. Test Case for Professor User: Sections

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"My section"** icon/button.	Display the professor handle section.
2	Click one of the teacher's	student displays. The students name, current level, exercise result, and quiz results
3	Click the **"Exercise result"** display.	was shown. Display the exercise students
4	Click the steno picture.	have taken.
5	Click the **"Close"** button.	Display the full view of the steno
6	Click the **"Quiz result"** picture. display.	The steno picture would close.
7	Click the **"Close"** button.	Display the quiz students have taken. The steno picture would close.

The table 19 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the section page of the professor, along with the steps' numbers, detailed information, and expected results. The test was

performed using the actual statements identified by the measuring statement identifiers above.

Table 20. Test Case for Professor User: Edit Profile

	STEP DETAILS	EXPECTED RESULT
1	Click the Profile button/icon.	Display the profile picture, first name, last name, and **"save changes"** button.
2	Click the **"Camera Icon".**	Display the device's photos.
3	Click the chosen photo.	The selected photo was display Display the first name and last
4	Input new first and last name.	name. Display the edited profile.
5	Click the **"Save changes"** button.	

The table 20 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the edit profile of the professor, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 21. Test Case for Professor User: Frequently Asked Questions

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the FAQ button/icon. question and page number.	Display the frequently asked
2	Click the **"Next (>)"** button.	Display the next page of the FAQ.
3	Click the **"Back (<)"** button.	Display the previous page of the FAQ.

The table 21 displays the testing tool's first appearance as it would be used by the students. It demonstrates the exact processes involved in the Frequently Asked Questions of the professor, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 22. Test Case for Professor User: Logout

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the **"Logout"** button at the navigation bar.	Display login page.

The table 22 shows the initial appearance of the testing tool that is intended for the professors. It shows the step-by-step process of professor logout with step number, step details, and the expected results of the steps.

C. Stenofied mobile application test sheet for Program Coordinator Table

23. Test Case for Program coordinator User: Login

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Input email and password.	Display the email, and the password was encrypted up.
2	Click the **"Eye Icon".**	The inputted password can be displayed or concealed.
3	Click the **"LogIn"** button.	It would direct to the home page.

The table 23 shows the initial appearance of the testing tool that is intended for the program coordinator. It shows the step-by-step process of program coordinator login with step number, step details, and the expected results of the steps.

Table 24. Test Case for Program coordinator User: Home page

	STEP DETAILS	EXPECTED RESULT
1	Click the **"Student records"** displayed.	12 Click the **"Assign new Students"** button.
2	Click one of the students' who are not yet verified.	
3	Click the **"verify students" button.**	13 Click the **"Pencil"** icon. 14 Input section name.
		15 Click the **"Edit section"** button.
		16 Click the **"Logout"** button at Display the registered students.
4	Click the **"deny students"** button.	The students' profile, section, exercise result, and quiz result were displayed.
		The students are now verified and can login their account. Thus, without admin verification a sneak bar message in the login
5	Click the **"Exercise result"** button.	page showed indicating, - your account has not yet been verified by the admin. The students can't open their account and a sneak bar message
6	Click the **"Quiz result"** button.	show indicating, - Error login
7	Click the **"Teacher records"** display. 8 Click one of the teachers displays.	The students' past exercise was shown. The student's past quiz was shown.
9	Click the **"Section records"** display.	
10	Click one of the sections displayed.	Display the registered teachers.
11	Click the **"Assign new Teacher"** button.	The teacher's profile and handle section were displayed. The sections were displayed.

The section name, teacher, and students were shown.	The available students were displayed. Thus, without any available students a snack bar message appeared indicating, - No available Students.
Display all the teachers available. Thus, without any available teacher a snack bar message appeared indicating, - No available teachers.	Display the edit section. Display the inputted section name.
	A snack bar message appeared indicating, - successfully edited this section, it would go back to
the navigation bar.	the chosen section displayed. Display the login page.

The table 24 displays the testing tool's first appearance as it would be used by the program coordinator. It demonstrates the exact processes involved in the home page of the program coordinator, along with the steps' numbers, detailed information, and expected results. The test was performed using the actual statements identified by the measuring statement identifiers above.

Table 25. Test Case for Program coordinator User: Edit Profile

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the Profile button/icon.	Display the profile picture, first name, last name, and **"save changes"** button.
2	Click the **"Camera Icon".**	Display the device's photos.
3	Click the chosen photo.	The selected photo would be display
4	Input new first and last name.	Display the first name and last name.
5	Click **"Save changes"** button	Display the edited profile.

The table 25 shows the initial appearance of the testing tool that is intended for the program coordinator. It shows the step-by-step process of program coordinator edit profile with step number, step details, and the expected results of the steps.

Table 26. Test Case for Program coordinator User: Frequently Asked Questions

STEP NO.	STEP DETAILS	EXPECTED RESULT
1	Click the FAQ button/icon.	Display the frequently asked question and page number.
2	Click the **"Next (>)"** button.	Display the next page of the FAQ.
3	Click the **"Back (<)"** button.	Display the previous page of the FAQ.

The table 26 shows the initial appearance of the testing tool that is intended for the program coordinator. It shows the step-by-step process of program coordinator Frequently Asked Questions with step number, step details, and the expected results of the steps.

Testing method

For this research entitled "A Comparative Survey on Software Testing Tools" Based on Chevuturu A. A. (2022) Testing is an essential part of the Software Development Life Cycle, with a growing shift from manual to automated testing to save time and costs. A wide range of open-source and commercial testing tools are available, making it challenging to select the best option due to varying features and costs. This study compares popular testing tools and provides a review to help developers choose the most suitable option based on their needs.

In conducting the actual test, the researchers used the dichotomous scale - "pass" or "fail" as a tool to assess if the developed application reflects based on the actual test input.

Figure 5. *The Structure Format of the Testing Tool*

The researchers integrate the actual test into the testing instrument that could be evaluated to the expected result indicated on the test sheets. The researchers provided these test cases to the system testers to validate all of the criteria, steps specifics, and expected results specified.

System User Evaluation

In this evaluation phase, the software evaluation phase centered on the users' thoughts, perspectives, perceptions, and reactions to the developed application. This phase emphasized the important parts and steps made by

the researchers, from the creation of the evaluation tool to its implementation.

The researchers went through many processes to determine and evaluate the technology adoption of the produced application, including:

a) Evaluation Tool

b) Evaluation Method

c) Validation of Questionnaire

d) Distribution of Questionnaire

Evaluation Tool

The researchers constructed a questionnaire that served as the evaluation tool. The researchers' questions are based on the Technology Acceptance Model (TAM) that cover quality factors, perceived usefulness, maintainability, reliability, time series analysis, and cost-benefit analysis.

According to Hassan B. M. A. (2020) Technology Acceptance Models (TAM) discuss the advantages, disadvantages, and contributions of the previous iteration of this theory. Information technology acceptability, adoption, and use are assessed using Davis's (1989) TAM model. Perceived utility and ease of use are the two TAM constructs that are most frequently utilized. The TAM model, which is one of the most successful models, has greatly increased in favor among researchers. TAM differs from previous models in that it doesn't track success. It is utilized, nevertheless, to look into and forecast people's intentions to use information technology.
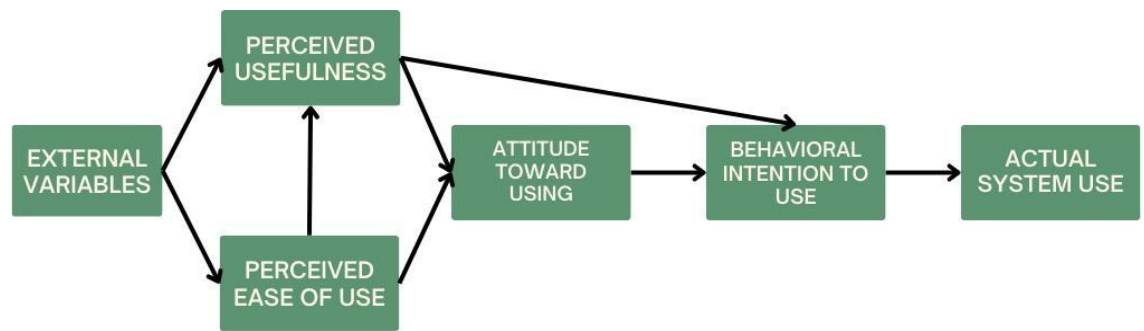
Figure 6: *Technology Acceptance Model*

The figure 6 shows the flow of the Technology Acceptance Model (TAM), which are the quality factors, perceived usefulness, maintainability, reliability, time series analysis, and cost-benefit analysis.

Figure 7: *ISO/IEC 25010 Software Quality Metrics*

The figure 7 above shows the different types of Software Quality Metrics that used by the researchers as the sub-metrics to the Technology Acceptance Model (TAM) categories in the evaluation questionnaire. Each TAM requirement includes three software quality measurements derived from ISO/IEC 25010 software quality metrics. The image below shows the structure of the questionnaire with TAM criteria and ISO/IEC 25010 software metrics.
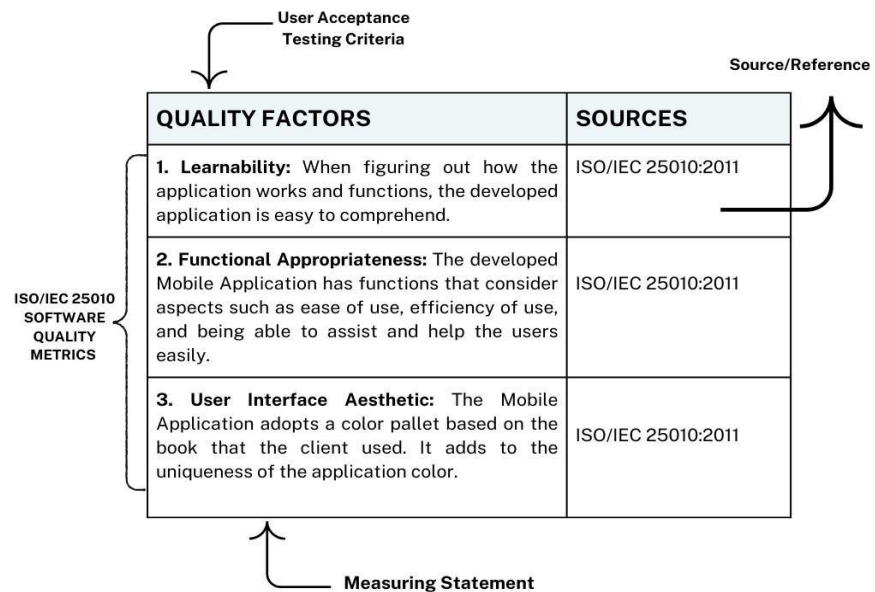
Figure 8: The Structural Format of the Questionnaire Validation above illustrates the

structure of the evaluation instrument.

The questionnaire is shown in Figure 8 together with three (3) ISO software measures, such as the source and measurement statement, and User Acceptance Testing Criteria. Under the performance efficiency of the ISO software quality metrics, the learnability, functional appropriateness, and aesthetics of the user interface are demonstrated by the sample structure format of the questionnaire from the figure example.

Evaluation Method

The researcher's adviser was validate the survey questionnaire before handing it out to the target respondents. The questionnaire that was prepared by the researcher is designed to gather data regarding the respondent experience and thought with the mobile application. The survey questionnaire consists of a series of questions that are aligned with the objectives of the study. The assessment tool that the researchers used to provide to the respondents in order to evaluate the study is displayed below:

Figure 9: *The Structural Format of the Evaluation Tool*

The figure 9 shows the evaluation tool used by the researchers to assess the study by handing it out to the target respondents. The figure above shows the questionnaire that consists of collective data of the respondents. As well as the user evaluation form.

Validation of Questionnaire

Before conducting the evaluation of the proposed application on the respective respondents, it is necessary to verify and authenticate the validity of each questionnaire item prior to distribution; therefore, the researchers incorporated a face validity and virtual approach. Nonetheless, the researchers then consulted with their research adviser to confirm the validity of the self-structured questionnaires. Mr. Gener F. Mosico, MSIT reviewed the questions for the first time on September 19, 2024; however, minor

adjustments should be made to the questionnaires. Researchers were able to retest the surveys on November 05, 2024, after applying all changes, and Mr. Gener F. Mosico, MSIT then verified the questionnaires.

Ultimately, the sample evaluation tools for application interfaces in terms of their Quality Factors, Perceived Ease of Use, Perceived Usefulness, Experience, Attitude Towards Using, and Behavioral Intention to Use employed during the evaluation phase are provided below.

Table 27. Questionnaires for Program coordinator: Quality factors

QUALITY FACTORS	SOURCES
Learnability. The developed application is easy to comprehend. **Functional Appropriateness.** The developed application has functions that consider aspects such as ease of use, efficiency of use, and being able to assist and help the users easily. **User Interface Aesthetic.** The application adopts a color palette based on the book that the client used. It adds to the uniqueness of the application color.	ISO/IEC 25010:2011 ISO/IEC 25010:2011 ISO/IEC 25010:2011

The table 27 outlines the quality factors for the program coordinator side of our application using three key questions: learnability, functional appropriateness, and user interface aesthetic. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance. This approach helps us understand and improve the application effectiveness in managing administrative tasks.

Table 28. Questionnaires for Program coordinator: Perceived ease of use

PERCEIVED EASE OF USE	SOURCE
Efficiency. The designed application is easy to use even by a new user.	ISO/IEC 25010:2011

Functional Appropriateness. Without any software or ISO/IEC 25010:2011 technological expertise, the application is controllable by users. **Usability.** The mobile application provides accurate information ISO/IEC 25010:2011 based on the student's proof of enrollment and the professor's proof of employment.

The table 28 outlines three questions designed to assess comfort and user friendliness on the program coordinator side of the researcher's developed application, focusing on the Technology Acceptance Model (TAM), which evaluates perceived ease of use.

Table 29. Questionnaires for Program coordinator: Perceived usefulness

PERCEIVED USEFULNESS	SOURCE
Accessibility. The application generated has accurate and 25010:2011 precise results.	ISO/IEC
Functional Appropriateness. The developed application was 25010:2011 able to view, approve, or delete the enrollment proof, and designate a student to their section.	ISO/IEC ISO/IEC 25010:2011
Adaptability. I can see how this method could be used more often than the manual procedure.	

The table 29 outlines the perceived usefulness for the program coordinator side of the researcher's application using three key questions: accessibility, functional appropriateness, and user adaptability. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance.

Table 30. Questionnaires for Program coordinator: Experience

EXPERIENCE	SOURCE
I confirmed that the designed application is functioning properly 25010:2011 in every way.	ISO/IEC
I have never experienced errors or problems with the application 25010:2011 while using it.	ISO/IEC
The application provided convenience for administrators who 25010:2011 used it.	ISO/IEC

The table 30 outlines the experience for the program coordinator side of the researcher's application using three key questions. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance.

Table 31. Questionnaires for Program coordinator: Attitude toward using

ATTITUDES TOWARD USING	SOURCE
The application that has been designed enables users to save time when gathering the required data.	ISO/IEC 25010:2011
The application that was designed helps the administrators keep track of how many students are registered.	ISO/IEC 25010:2011
The application that was built works well.	ISO/IEC 25010:2011

The table 31 outlines the attitude toward using it for the program coordinator side of the researcher's application using three key questions. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance.

Table 32 Questionnaires for Program coordinator: behavioral intention of use

BEHAVIOURAL INTENTION TO USE	SOURCE
The developed application provides the required and expected data.	ISO/IEC 25010:2011
The effectiveness and efficiency of the application satisfy me.	ISO/IEC 25010:2011
The general flow of the application is clear and easy to understand.	ISO/IEC 25010:2011

The table 32 shows the Initial evaluation tools for program coordinator. It presents the question, standards, evaluation criteria, and sources for the application.

This was evaluated based on face validity technique.

Table 33. Questionnaires for Professor: Quality factors

QUALITY FACTORS	SOURCES
Learnability. The developed application is easy and simple to 25010:2011 understand.	ISO/IEC
Functional Appropriateness. The developed application has functions that consider aspects such as the ease of navigation, 25010:2011 efficiency in grading student activity, and ability to easily see the student's quizzes and exercises.	ISO/IEC
User Interface Aesthetic. The internet-based program adopted ISO/IEC 25010:2011 a suitable color scheme, which enhanced its uniqueness and improved users' visual comfort.	

The table 33 shows the Initial evaluation tools for professors. It outlines the quality factor using it for the professor side of the researcher's application using three key questions. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance.

Table 34. Questionnaires for Professor: Perceived ease of use

PERCEIVED EASE OF USE	SOURCE
Efficiency. The designed application is easy to use even by a ISO/IEC 25010:2011 new user. **Functional Appropriateness.** Without any software or ISO/IEC 25010:2011 technological expertise, the application is controllable by users. **Usability.** The application is user-friendly and easy to mark ISO/IEC 25010:2011 and record the score of the students.	

The table 34 shows the Initial evaluation tools for professors. It outlines the perceived ease of use using it for the professor side of the researcher's application using three key questions: efficient, functional appropriateness, and usability. Each question corresponds to important ISO criteria, providing a straightforward yet comprehensive evaluation of the application performance.

Table 35. Questionnaires for Professor: Perceived usefulness

PERCEIVED USEFULNESS	SOURCE

Accessibility. The application generated has accurate and ISO/IEC 25010:2011 precise results.	
Functional Appropriateness. Developed application was able ISO/IEC 25010:2011 to view, verify, record a grade, and give feedback to students.	
Adaptability. I can see how this method could be used more ISO/IEC 25010:2011 often than the manual procedure.	

The table 35 displays the professor's initial evaluation tools. With

three main questions: accessibility, functional appropriateness, and

adaptability, it describes the perceived usefulness that is used for the

professor portion of the researcher's application. A clear and thorough

assessment of the application's performance is provided by each inquiry,

which relates to significant ISO criteria.

Table 36. Questionnaires for Professor: Experience

EXPERIENCE	SOURCE
I confirmed that the designed application is functioning properly in every way.	ISO/IEC 25010:2011
I have never experienced errors or problems with the application while using it.	ISO/IEC 25010:2011
The application provided convenience for professor who used it.	ISO/IEC 25010:2011

The table 36 displays the professor's initial evaluation tools. With

three main questions, it describes the experience that is used for the

professor portion of the researcher's application. A clear and thorough

assessment of the application's performance is provided by each inquiry,

which relates to significant ISO criteria.

Table 37. Questionnaires for Professor: Attitude toward using

ATTITUDES TOWARD USING	SOURCE
The application that has been designed enables users to save time when gathering the required data.	ISO/IEC 25010:2011

The application that was designed helps the professor to keep ISO/IEC 25010:2011 track of the students' lessons, quizzes and exercises. The application that was built works well. ISO/IEC 25010:2011 The table 37 displays the professor's initial evaluation tools. With three main questions, it describes the attitude toward using that is used for the professor portion of the researcher's application. A clear and thorough assessment of the application's performance is provided by each inquiry, which relates to significant ISO criteria.

Table 38. Questionnaires for Professor: Behavioral intention to use

BEHAVIOURAL INTENTION TO USE	SOURCE
The developed application provides the required and expected ISO/IEC 25010:2011 data. ISO/IEC 25010:2011	
The effectiveness and efficiency of the application satisfy me. ISO/IEC 25010:2011 The general flow of the application is clear and easy to understand.	

The table 38 displays the professor's initial evaluation tools. With three main questions, it describes the behavioral intention to use that is used for the professor portion of the researcher's application. A clear and thorough assessment of the application's performance is provided by each inquiry, which relates to significant ISO criteria.

Table 39. Questionnaires for Student: Quality factors

QUALITY FACTORS	SOURCES
Learnability. The developed application is easy and simple to ISO/IEC 25010:2011 understand.	
Functional Appropriateness. The created application has all ISO/IEC 25010:2011 the capabilities and functionalities that the user requires.	
User Interface Aesthetic. The themes are applied with ability, ISO/IEC 25010:2011 and the graphic design's crucial is excellent.	

The student's initial assessment instruments are shown in Table 39.

It explains the quality factors that are employed for the student's component

of the researcher's application with three key questions -learnability, functional appropriateness, and user interface aesthetic. Each question links to important ISO criteria and provides a clear and comprehensive evaluation of the application's performance.

Table 40. Questionnaires for Student: Perceived ease of use

PERCEIVED EASE OF USE
Efficiency. The designed application is easy to use even by a ISO/IEC 25010:2011 new user.
Functional Appropriateness. Without any software or ISO/IEC 25010:2011 technological expertise, the application is controllable by users. **Usability.** The application that has been developed is user-friendly.   ISO/IEC 25010:2011

The student initial assessment instruments are shown in Table 40. It explains the perceived ease of use that is employed for the student component of the researcher's application with three key questions - efficiency, functional appropriateness, and usability. Each question links to important ISO criteria and provides a clear and comprehensive evaluation of the application's performance.

Table 41. Questionnaires for Student: Perceived usefulness

PERCEIVED USEFULNESS
Accessibility.   The application generated has accurate and ISO/IEC 25010:2011 precise result.
Functional Appropriateness. The developed application was ISO/IEC 25010:2011 able to view, answer, translate, and note.
Adaptability.   I can see how this method could be used more ISO/IEC 25010:2011 often than the manual procedure.

The table 41 displays the student initial evaluation tools. With three main questions: accessibility, functional appropriateness, and adaptability, it describes the experience that is used for the student portion of the researcher's application. A clear and thorough assessment of the application's performance is provided by each inquiry, which relates to significant ISO criteria.

Table 42. Questionnaires for Student: Experience

EXPERIENCE
I confirmed that the designed application is functioning ISO/IEC 25010:2011 properly in every way.
I have never experienced errors or problems with the ISO/IEC 25010:2011 application while using it.
The application provided convenience for students who used it. ISO/IEC

25010:2011 The student initial assessment instruments are shown in Table 42.

It explains the experience that is employed for the student component of the

researcher's application with three key questions -application is functioning,

no error, and convenience for students. Each question links to important ISO

criteria and provides a clear and comprehensive evaluation of the application's

performance.

Table 43. Questionnaires for Student: Attitude toward using

ATTITUDES TOWARD USING
The application that has been designed enables users to save ISO/IEC 25010:2011 time when gathering the required data.
The application that was designed helps the students in ISO/IEC 25010:2011

monitoring lesson progress, quizzes, and activities.   The application that was

built works well.   ISO/IEC 25010:2011 The student initial assessment

instruments are shown in Table 43. It explains the attitude toward using that is

employed for the student component of the researcher's application with three

key questions -users save time, help the student, and the application works

properly. Each question links to important ISO criteria and provides a clear

and comprehensive evaluation of the application's performance.

Table 44. Questionnaires for Student: Behavioral intention to use

BEHAVIOURAL INTENTION TO USE
The developed application provides the required and expected ISO/IEC 25010:2011 data.

The effectiveness and efficiency of the application satisfy me. ISO/IEC 25010:2011 The general flow of the application is clear and easy to ISO/IEC 25010:2011 understand.

The student initial assessment instruments are shown in Table 44. It explains the behavioral intention to use that is employed for the student component of the researcher's application with three key questions. Each question links to important ISO criteria and provides a clear and comprehensive evaluation of the application's performance.

Subsequently, aside from TAM and ISO/IEC 25010 software quality metrics, Likert rating scales are also used by researchers to measure the level of acceptability of the respondents.

Likert Scale

The Likert scale table range score and interpretation used for assessing the level of acceptability are provided below along with the Likert Scale Formula

Likert Scale Formula: $\underline{(HA \times 5) + (A \times 4) + (MA \times 3) + (FA \times 2) + (NA \times 1)}$

Total Number of Respondents

Equation 1. *Likert Scale Formula*

Table45. Likert Scale

SCALE	RANGE	VERBAL INTERPRETATION
5	4.20 – 5.00	Highly Acceptable
4	3.40 – 4.19	Acceptable
3	2.60 – 3.39	Undecided
2	1.80 – 2.59	Slightly Unacceptable
1	1.00 – 1.79	Unacceptable

The table 45 shows the Likert scale is used by the researchers to measure the level of satisfaction of the respondents. The table consists of scale, rating, and equivalent verbal interpretation. The verbal interpretation ranges from Highly Acceptable (5) being the highest level of interpretation to Unacceptable (1) the lowest level of interpretation.

Distribution of Questionnaire

The distribution of the questionnaire consists of a two-step process at different instances. To start with, the researchers used the face-to-face process, using a printed survey questionnaire that was handed to the target respondents which is for administrator, professor, and students of Bachelor of Science in Office Administration.

In the second process, the respondents actively used the application, providing ratings and feedback to evaluate whether the application was easier to use and clear to understand, than the manual procedure. These two processes of distribution of questionnaires allow the Comprehensive evaluation of the application efficiency and usability from both the proponents and from the respondent's perspective.

Statistical Treatment

The statistical treatment of data is important to the research of the researchers due to utilizing the data in the correct format. The collection of needed data is part of the research. To achieve appropriate outcomes, data must be organized and analyzed properly. It is crucial to present the results obtained, the researcher must complete and submit the result as frequency

and percentage, while the qualitative variables must submit the presentation as mean and standard deviations. According to Birket, A. (2022), stated that dichotomous scales ("pass or fail") are great for precise data as they have two choices that are diametrically opposed to each other. A dichotomous scale gives you a clearer, binary answer, but it can also fall prey to fatigue, and do not allow for nuance in respondents' answers.

The researchers used the frequency and percentage of data to figure out how functional the developed mobile application was. The researchers used the following formula: *(1) Frequency and Percentage Distribution; (2) Mean; (3) Standard Deviation*

Frequency and Percentage Distribution

It is a particularly useful method of expressing the relative frequency of survey responses and other data within this study of Lavrakas P. (2013) titled "Percentage Frequency Distribution" A percentage frequency distribution is a display of data that specifies the percentage of observations that exist for each data point or grouping of data points. Many times, percentage frequency distributions are displayed as tables or as bar graphs or pie charts.

Frequency and Percentage: $\% = \dfrac{f}{N} \times 100$

Where: % = Percentage

f = frequency of passed "passed" and "failed"

N = number of tests done

Equation 2. The Formula of the Frequency and Percentage

The researchers evaluated the data collected for the testing phase using the frequency and percentage distribution to assess the produced mobile application's functionality.

In the evaluation phase, the mean and standard deviation were used by the researchers based on the level of acceptability, the survey responses were statistically processed in order to gain acceptance of the developed application. The mean formula used to statistically treat the data collected.

Mean

In the analysis of D'Errico G. E. entitled "A systematic treatment of statistical methods for measurand estimation" The study presents the results of various statistical methods for pointwise estimation, comparing estimation criteria such as unbiasedness, minimum mean square error, maximum likelihood, least squares, and decision theory.

Decision theory stands out as a concise and robust framework that can unify both 'frequentist' and 'Bayesian' estimation approaches, while minimizing the need for ad hoc solutions.

Mean Formula:
$$\underline{x} = \frac{\Sigma x}{N}$$

Where: $\underline{x}$ = Mean
Σx = Sum of all data values

N = Total number of respondents

Equation 3. Formula of the Mean

The researchers used mean that can be used to represent the typical value and to get the average of the respondent's responses.

Standard deviation

In the line with Acutis M. et al (2022) in the title "EX-TRACT: An excel tool for the estimation of standard deviations from published articles" Many authors are unsure whether to present the mean with the standard deviation (SD) or the standard error of the mean (SEM). The SD is a descriptive statistic that measures the variability of individual data points around the sample mean, making it a key indicator of the sample's spread. In contrast, the SEM reflects the precision of the sample mean in estimating the population mean and does not describe the sample itself. Therefore, the mean should always be accompanied by the SD, as it provides a more accurate representation of the sample's dispersion.

Standard Deviation Formula: $$SD = \frac{\sqrt{\Sigma(r_i - r_{avg})2}}{n-1}$$

Where: SD = Standard Deviation

n = Population Size

r_i = Each value from

Population r_{avg} =

Mean

Equation 4. Formula of the Standard Deviation

The researchers used the standard deviation formula above as the statistical treatment of the gathered data.

LITERATURE CITED

Abu-Zahra, M. J., & Shayeb, A. S. (2020). Do mobile translation apps enhance

or hinder translation trainees' linguistic competence: The case study of

translation

student   sa   tBirzeitUniversity
https://eric.ed.gov/?q=advantage+of+translation+in+student+&id=EJ1
379588

Acutis, M., Tadiello, T., Perego, A., Di Guardo, A., Schillaci, C., & Valkama,
E.

(2021). EX-TRACT: An excel tool for the estimation of standard

deviations from published articles. Environmental Modelling &

Software, 147, 105236.

https://doi.org/10.1016/j.envsoft.2021.105236

Ahuja, A., & Upadhyay, R. (2022). *Data collection instruments in educational*

research. Mendeley. https://www.mendeley.com/catalogue/68b604f5-
89af-

332f-981b 72e50e718ffe

Alotaibi, H., & Salamah, D. (n.d.). T*he impact of translation apps on translation*

*students'performance.*https://eric.ed.gov/?q=mobile+app+translation+

&id=EJ

1388278

Ana-Paula, et al, A. (2020). A case study of learners' engagement in mobile

learning

applications.https://eric.ed.gov/?q=Learning%20application&ff1=dtySi

nce_20

20&id=EJ1334361&fbclid=IwAR0S_Q1cNXBKYTWWn6bpUNNsz0

UxsSN

vpWfQipo3mdirV_LYmrgwZ7q9DRw_aem_AYEz2d_r98jzbxcgvbO

aE6cq4

K0iAJsaImuOhn3uq5Dc_SlM9gJWjn61PXUdNqkCN0MiPxKdeRf1n
ggx209

LAwMO

Amaefule, C. O., Breitwieser, J., Biedermann, D., Nobbe, L., Drachsler, H., & Brod,

G. (n.d.). Fostering children's acceptance of educational apps: The

importance of designing enjoyable learning activities.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%20colle
ge&pg=2&id=EJ1387851&fbclid=IwAR3xieywNHeaAK_62jSPMdtR0cYC0

Cwh4NWIwOYIn8ZwuARg8XJOWTI7uwU_aem_AYEli84Ic0WZfyuR

GvU1CFEJ2dC_5BZKInO65DHDEDgKklOYqbEOgfMWBWjqG57Zp

-WtKBpDNaofYO0Uz-zYqT

Anderson, K., Ryan, B., Sonntag, W., Kavvada, A., & Friedl, L. (2017). Earth

observation in service of the 2030 Agenda for Sustainable Development.

Geo-

spatial Information Science, 20(2), 77–96.
https://doi.org/10.1080/10095020.2017.1333230

Angelina, A., Weliati, W., Wardoyo, E. C. J., & Hartono, S. (2021). Mobile

application design for student learning. Advances in Science

Technology and Engineering

Systems Journal, 6(1), 776–782. https://doi.org/10.25046/aj060186

Ampofo, J. A. (2020b). CHALLENGES OF STUDENT MANAGEMENT

INFORMATION SYSTEM (MIS) IN GHANA: A CASE STUDY OF

UNIVERSITY FOR DEVELOPMENT STUDIES, WA CAMPUS.

International Journal of Management & Entrepreneurship Research, 2(5), 332–

343. https://doi.org/10.51594/ijmer.v2i5.167

Armanious, M., & Padgett, J. D. (n.d.). Agile learning strategies to compete in an

uncertain business environment.

https://eric.ed.gov/?q=Advantage%20of%20agile%20methodology%20&id=E

J1311359&fbclid=IwZXh0bgNhZW0CMTAAAR2iXy-

Y65wMOmZshjT0dtYRgU5bOTHCs_1wxigZNDKeIVe9weMLDOT0je

I_ae

m_Aea01fteMsZBx7nz7Bhr_kMele0ah7ZHY7tAyml3sbSbQsu1R0nH2

Y1dXgsG4etJ2s

SL57yf2l88EAuXMTYVX4W

Arinova, B., Pyatkina, D., Latysheva, V., & Stroiteleva, N. (n.d.). Mobile

Applications in Education: Implementation aspects and impact on

student competencies development.

https://eric.ed.gov/?q=mobile+application&id=EJ1343912

Asio, J. M. R., Leva, E. F., Lucero, L. C., & Cabrera, W. C. (n.d.). Education

Management Information System (EMIS) and Its Implications to Educational

Policy: A Mini-Review.

https://eric.ed.gov/?q=management+information+system&id=ED6218 44

Barbosa, A. T., Da Silva, C. C., Caetano, R. L., Da Silva, D. P. S., Barbosa, J. V., &

Pinto, Z. T. (2022). AGILE METHODOLOGIES: AND ITS APPLICABILITY

IN THE MARKETING AREA. Revista Ibero-Americana De Humanidades,

Ciências E Educação, 8(3), 1659–1669.

https://doi.org/10.51891/rease.v8i3.4751

Barman, L., & Kjällander, S. (n.d.). Playful and Meaningful Learning of

Programming. What Does It Take to Integrate an App-Based Game

Promoting Digital

Mathematics into Early Childhood Education?.

https://eric.ed.gov/?q=Advantage+of+Learning+App+in+college&pg=
19&id=

EJ1370322

Blazhko, L., Rassokha, I., & Rendiuk, S. (2021). USE OF MOBILE
APPLICATIONS

IN THE LEARNING PROCESS. THE SOURCES OF
PEDAGOGICAL

SKILLS, 26, 18–21. https://doi.org/10.33989/2075-
146x.2020.26.227421

Büyükbayraktar, F. N., & Dilber, R. (n.d.). Teaching of Magnetism unit topics

via activeLearning-applications.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&pg=
2&id=

EJ1356425

Bristola, N. G. a. M., & Calderon, N. J. C. (2022). Integrating of voice

recognition email application system for visually impaired person

using linear regression algorithm. South Asian Journal of

Engineering and Technology, 12(1), 74–83.

https://doi.org/10.26524/sajet.2022.12.012

Bristola, G. a. M. (2022). Integrating of voice recognition email application

system for visually impaired person using linear regression algorithm.

South Asian Journal

of Engineering and Technology, 12(1), 74–83.
https://doi.org/10.26524/sajet.2022.12.12

Casteel, A., & Bridier, N. (2021). Describing populations and samples in
doctoral student research. International Journal of Doctoral Studies, 16,
339–362.
https://doi.org/10.28945/4766

Camilleri, M. A., & Camilleri, A. C. (2021b). The Acceptance of Learning
Management Systems and Video Conferencing Technologies:
Lessons Learned from COVID-19. Technology, Knowledge and
Learning, 27(4), 1311–1333. https://doi.org/10.1007/s10758-021-
09561-y

Chen, K. T. C. (2022). Speech-to-text recognition in University English as a
Foreign
Language Learning. Education and Information Technologies, 27(7),
9857–
9875. https://doi.org/10.1007/s10639-022-11016-

Davudova, E., & Türel, Y. K. (n.d.). Evaluation of Mobile Applications in
Foreign
Language Learning at Early Age.
https://eric.ed.gov/?q=mobile+application&ff1=dtySince_2020&pg=4
&id=EJ
1352465

De Man, J., Campbell, L., Tabana, H., & Wouters, E. (2021). The pandemic of
online
research in times of COVID-19. BMJ Open, 11(2),
e043866.
https://doi.org/10.1136/bmjopen-2020-043866
Debnath, O., Debnath, S., Paul, D., Kar, A., & Paul, M. (2020). GAMES ON

ANDRIOD APP IS SUPPORTING THE STUDENT'S ENGLISH

LANGUAGE. International Journal of English Learning & Teaching Skills,

3(1), 1703–1716. https://doi.org/10.15864/ijelts.3105

Demirtaş, E., & Özçelik, S. (2021). Music students' use of mobile

applications for learning purposes. International Journal of Modern

Education Studies, 5(2). https://doi.org/10.51383/ijonmes.2021.135

D'Errico, G. E. (2009). What does mean mean? – A systematic treatment of statistical

methods for measurand estimation. Measurement, 43(4), 504–512.

https://doi.org/10.1016/j.measurement.2009.12.016

Dlalisa, S. F., & Govender, D. W. (2020b). CHALLENGES OF ACCEPTANCE AND

USAGE OF A LEARNING MANAGEMENT SYSTEM AMONGST

ACADEMICS. International Journal of Ebusiness and Egovernment Studies,

63–78. https://doi.org/10.34111/ijebeg.202012105

deVille, B., & Bawa, G. S. (2021). Speech to Text. *Speech to*

Text, 139–155. https://doi.org/10.1002/9781119487142.ch8

Dwijayanti, S., Abid, M., & Yudho, B. (2021). Speech-to-Text conversion

in Indonesian language using a deep bidirectional Long Short-Term

Memory algorithm. International Journal of Advanced Computer

Science and Applications/International Journal of Advanced

Computer Science &

Applications, 12(3). https://doi.org/10.14569/ijacsa.2021.0120327

Elrod, C. C., Stanley, S. M., Cudney, E. A., Hilgers, M. G., & Graham, C. (n.d.).

Management Information Systems Education: A Systematic Review.

https://eric.ed.gov/?q=management+information+system&id=EJ13770
55

Ekoç, A. (2020). Mobile Language Learning Applications from the
Perspectives of

Adult Language Learners in Turkey.

https://eric.ed.gov/?q=Learning%20application&ff1=dtySince_2020&pg

=2&i

d=EJ1309677&fbclid=IwAR3gfip8Xcn7wnrrvwst81pigGpXA1g54x02h

uKJSy0pmjcfp6KlqHg5tk_aem_AYETNk5NzJ1ssQEDUwpMlmzzp3Ft

c

2R4xvtsua3mBpC48Ly3Pf806qRANAG8EyvipiRm6LXkn1-

88zhGEU7HwjyU

Fadhil, S., Mahmood, N., & Ahmed, N. (2021). The significance of
management

Information system in improving organizational performance and

effectiveness. Govarî Zankoî Germîan/Govarî Zankoy Germyan, 7(4),

195–211.

https://doi.org/10.24271/garmian.207017

Findley, B. R., & Gasparyan, D. (2022). Use of Speech-to-Text Biofeedback in

Intervention for Children with Articulation
Disorders.

https://eric.ed.gov/?q=speech+to+text&id=EJ1348427

Firdaus, H., & Zakiah, A. (2021). Implementation of usability testing

methods to   measure the usability aspect of Management

Information System Mobile Application (CASE Study Sukamiskin

Correctional Institution). International Journal of Modern Education
and Computer Science, 13(5), 58–67.

https://doi.org/10.5815/ijmecs.2021.05.06

Flores-Cerna, F., Sanhueza-Salazar, V., Valdés-González, H., & Reyes-Bozo,
L. (2021). Agile Methodologies: An Analysis of the Organizational
Challenges for

their   Implementation.   Mendeley.

https://www.mendeley.com/catalogue/689cbd71-9a0d-3d76-

8be1a125513efa54

Fonggi, Y. A., & Oktavianus, T. (2021b). Analysis of Voice Recognition
System on Translator for Daily Use. *Engineering MAthematics and
Computer Science*

(EMACS) Journal, *3*(2), 43–46.

https://doi.org/10.21512/emacsjournal.v3i2.7018

Gao, Y., & Pan, L. (2023). Learning English Vocabulary through Playing
Games: The   Gamification Design of Vocabulary Learning
Applications and Learner Evaluations.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&id=
EJ1395

087

Guadelupe, S. R., Freitas, D. P., Rodrigues, D. C. P. V., & Jatobá, A. (2023).
Monitoring Student Performance through an Agile Project-Based
Assessment

Strategy   for   Distance   Higher   Education.

https://eric.ed.gov/?q=Advantage%20of%20agile%20methodology%20&id=E

J1343930&fbclid=IwZXh0bgNhZW0CMTAAAR1Bm0YBLxZqwb-upnSr-

oivT5IxNYGIqqZ1DlNIAONUePLBNBl6vfH7RE_aem_AeY9gPEKL7tX4Od

Tpasx04-wyKRQ-

4b5ogsTUVWFZCGbfz4EGw8walLxMxkqJVL4zd2yRAmeODJwFk
L_xbU

KPl2F

Guimarães, L. M., & Da Silva Lima, R. (2021). Active Learning Application in

Engineering Education: Effect on Student Performance using Repeated

Measures   Experimental   design.

https://eric.ed.gov/?q=Learning%20application&ff1=dtySince_2020&

pg=2&i

d=EJ1318097&fbclid=IwAR1aDlvgIEX_FLEVbbnDMbSvqIXzPCg5r

QVoD

D4f4lzKeoFT3p4uAbIvmlE_aem_AYHKKyXNSMx3Iv0aYJ7DroNiF
2W4yPYkGrV8tbDeeoTHrIyfB_KCIx5Jmk9SX1j5krBYT9CoiyO_Rp
-

FYuy3SqT

Hamdani, S. A., Prima, E. C., Agustin, R. R., Feranie, S., & Sugiana, A. (2022).

Development of Android-Based interactive multimedia to enhance
critical

thinking   skills   in   learning   matters.

https://eric.ed.gov/?q=android&id=EJ1342853

Haq, M. S. (2023). Development of PKM Center Mobile learning applications

based on Android. Jurnal Penelitian Pendidikan IPA, 9(10), 8422–

8429.

https://doi.org/10.29303/jppipa.v9i10.4817

Hinze, A., Vanderschantz, N., Timpany, C., Cunningham, S. J., Saravani, S., & Wilkinson, C. (2022). A study of mobile app use for teaching and research in higher education. Technology, Knowledge and Learning, 28(3), 1271–1299. https://doi.org/10.1007/s10758-022-09599-6

Hidayat, W., Rohaeti, E. E., Hamidah, I., & Putri, R. I. I. (2023). How can android- based trigonometry learning improve the math learning process? Frontiers in

Education, 7. https://doi.org/10.3389/feduc.2022.1101161

Hirai, A., & Kovalyova, A. (2023). Using Speech-to-Text Applications for Assessing English Language Learners' Pronunciation: A Comparison with Human Raters.

In English language education (pp. 337–355). https://doi.org/10.1007/978-3-031-27825-9_17

Hsiao, S. J., & Tseng, H. T. (2020). The impact of the moderating effect of psychological health status on nurse healthcare management information

system usage intention. Healthcare, 8(1), 28. https://doi.org/10.3390/healthcare8010028

Hussein, L. A., & Hilmi, M. F. (2021). The influence of convenience on the usage of learning management system. Electronic Journal of e-Learning, 19(6), pp504-

515. https://doi.org/10.34190/ejel.19.6.2493

Ibrahim, Z., & Marcaccio, S. E. (2023). Study population. In Elsevier eBooks (pp. 103–

105). https://doi.org/10.1016/b978-0-323-91259-4.00105-3

Jayatilleke, B. G., Ranawaka, G., Wijesekera, C., & Kumarasinha, M. C. (2018b).

Development of mobile applications through design-based research. AAOU

Journal/AAOU Journal, 13(2), 145–168. https://doi.org/10.1108/aaouj-02-

2018-0013

Komar, O. A., Chuchalina, Y. M., Kramarenko, A. N., Torchynska, T. A., &

Shevchuk, I., V. (n.d.-b). Agile approach in training future primary

school teachers for

resolving   complex   pedagogical   situation.

https://eric.ed.gov/?q=Agile%20methodology&ft=on&id=EJ1297948
&fbclid=

IwZXh0bgNhZW0CMTAAAR226NQNr1C8-

WYsA_9knmUOMXn6J918e1kkWhx4rv8vmbbR35hCc_rBhg8_aem_

AeZd0

b9wzZ7ZTuq8wadBjYDKePC8QpWQgw7mIQwKXisajaFxj4N0nFN

6MpxH

AkLn71-dCoojsz-OIvXP3jZiACpN

Kumar, B. A., Goundar, M. S., & Chand, S. S. (n.d.). A framework for heuristic

evaluation   of   mobile   learning   applications.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&id=
EJ1258

905

Klimova, B., & Zamborova, K. (n.d.). Use of Mobile Applications in

Developing   Reading   Comprehension   in   Second   Language

Acquisition--A   Review   Study.

https://eric.ed.gov/?q=mobile+application&ff1=dtySince_2020&pg
=4&id=EJ

127971

Lebedeva, M., Taranova, M., & Beketov, V. (n.d.). Assessment of academic

achievements   in   M-Learning.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%2

0colle

ge&pg=3&id=EJ1377483&fbclid=IwAR1DnRLzb11KBubrU9p_xIgoC

uwl4ft UTxd96iX-GGTBKcCQ2CgfSNlRk70_aem_AYHDjNptjwB-

zGewuVi4nidjx4jaI-

itHgFF3MrqprIKWGVMAhamTX9evbS3cHu6KoZxuO-

9zv65NKn0vU3_Ywn

Lee, N., Ahn, S., & Lee, M. (2022). The effects of a mobile application for patient

participation to improve patient safety. Health Expectations, 25(4),

1601–1618. https://doi.org/10.1111/hex.13503

Li, H., Gao, G., Chen, R., Ge, X., Guo, S., & Hao, L. (2019). The influence

ranking for testers in bug tracking systems. International Journal of

Software Engineering

and   Knowledge   Engineering,   29(01),   93–113.

https://doi.org/10.1142/s0218194019500050

Lin, J., Huang, H., & Tsai, C. (n.d.). Mobile Collaborative Learning with
                                Social

Network   Awareness.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%20colle

ge&pg=11&id=EJ1392044&fbclid=IwZXh0bgNhZW0CMTAAAR0eQfrr5jN

1ejb0Mftj2MUw-zZIgIMjXia-

_E2hA9jTDS3em27gC5TsZHY_aem_AeFCEu4-

FAVq7Pp3YkgjPZ1nuzMT_HCR1B7X91fp22PmtyqDzl3rEhBwiSPi
AkBDav

HmFxZU

Lye, L. (2021). Investigating the effects of mobile apps on language
learning Outcomes:

A   study   on   Duolingo.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%2

0colle

ge&pg=5&id=ED643262&fbclid=IwAR2nQKNHrUD41hKWb6dXravq

1Zll5 wj75uxp9XPlC-

EkqEBeOwPArB1OSz0_aem_AYH7jCzLv3SZ7HMHqm8gmNhxRQ

HINv26aItasbs6jNgweEV5O1DODUEFHZmVggcnhBqVfqN8b3kuP

95N-

Bjxn1l

Millett, P. (2021). Accuracy of Speech-to-Text Captioning for Students
Who are Deaf

or   Hard   of   Hearing.   Mendeley.

https://www.mendeley.com/catalogue/1f844cf7-7088-399d-bd97-

4a072de2ea9e/

Milyarni, F. D., Mortini, A. V., & Mayasari, S. (2021). TRANSLATION EXERCISES

OF ENGLISH TO INDONESIAN IN DUOLINGO APPLICATION.
The

Journal of English Literacy Education the Teaching and Learning of

English   as   a   Foreign   Language,   8(2),   150–163.

https://doi.org/10.36706/jele.v8i2.15531

Mohtar, S., Jomhari, N., Omar, N. A., Mustafa, M. B. P., & Yusoff, Z. M.
(2023). The

Usability Evaluation on Mobile Learning Apps with Gamification for Middle-

Aged Women.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%20colle

ge&pg=3&id=EJ1363902&fbclid=IwAR1keOnCUViZROjTyFvkvKu

TW88c

PeUzgzdhZ4_Jcl4OHgwwpYoGcFSqolY_aem_AYGqOQjwd_fMcs8h rX_fB0

3ZCG5xmamYj2M2JOPfpbZVwaCOkJt7rgm4gQnmzsbfFclydG5gmp

77Igrru_iHim-

Mustafa, T. S. (2023). Development of Mathematics Mobile Learning

Application: Examining Learning Outcomes and Cognitive Skills

through Math Questions.

https://eric.ed.gov/?q=mobile+application&ff1=dtySince_2020&pg

=4&id=EJ

1366099

Nagdewani, S., & Jain, A. (2020). A review on methods for Speech-To-Text and Text-

To-Speech Conversion. Mendeley.

https://www.mendeley.com/catalogue/cca64db7-4bb0-361c-9544-

02cc30db12e8

Ocares-Cunyarachi, L., & Andrade-Arenas, L. (2022). Mobile Application Prototype:

Learning in the Programming course in Computer Engineering students.

International Journal of Advanced Computer Science and Applications,

13(7).

https://doi.org/10.14569/ijacsa.2022.0130791

Ok, M. W., Rao, K., Pennington, J., & Ulloa, P. R. (2020). Speech Recognition

Technology for Writing: Usage Patterns and Perceptions of Students
with High

Incidence Disabilities. *Journal of Special Education Technology*, *37*(2),
191–

202. https://doi.org/10.1177/0162643420979929

Okeke, C. O. (2021). Effect of Management Information System on
organizational

performance in manufacturing firm. Mendeley.

https://www.mendeley.com/catalogue/899d1aa5-dbf9-31d4-b14c-

368f8727ac42

Olson, K., Smyth, J. D., & Ganshert, A. (2018). The effects of respondent

and question characteristics on respondent answering behaviors in

telephone interviews. Journal of Survey Statistics and Methodology,

7(2), 275–308.

https://doi.org/10.1093/jssam/smy006

Özer, Z., & Demirbatir, R. E. (2023). Examination of STEAM-Based Digital
Learning

Applications   in   Music   Education.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&pg=
2&id=

EJ1377876

Peng, X. (2021). Thinking Path Schema of English Translation for Chinese

Classics: An Empirical Study on translation schema in translation

Courses.

https://eric.ed.gov/?q=advantage+of+translation+in+student+&id=

EJ1284448

Pócsová, J., Bednárová, D., Bogdanovská, G., & Mojžišová, A. (2020). Implementation

of agile methodologies in an engineering course.

https://eric.ed.gov/?q=Agile%20methodology&ft=on&id=EJ1277035&f

bclid= IwZXh0bgNhZW0CMTAAAR1Bm0YBLxZqwb-upnSr-

oivT5IxNYGIqqZ1DlNIAONUePLBNBl6vfH7RE_aem_AeY9gPEKL7

tX4Od

Tpasx04-wyKRQ-

4b5ogsTUVWFZCGbfz4EGw8walLxMxkqJVL4zd2yRAmeODJwFk
L_xbU

KPl2F

Poe, L., & Mew, L. (2022). The effects of using the Agile methodology as an

instructional format for software development courses.

https://eric.ed.gov/?q=Advantage%20of%20agile%20methodology%2

0&id=E

J1351412&fbclid=IwZXh0bgNhZW0CMTAAAR1k2DrITsl0m5Zo0m

Xr1_I

CEd4CiOjQ6zZXL2DOpDUOAQBGYltXTkUa_4_aem_AebHHtnyQ
fRoicW

XFK6c_rDj5bfNbXE_WP97qh36ntETnNxXgBsWPVP7DD0eD2PBG
Rnb0u

_TsRaT0SStB6csQCYV

Puebla, C., Fievet, T., Tsopanidi, M., & Clahsen, H. (2021). Mobile-Assisted Language

learning in Older Adults: Chances and challenges.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20in%20colle ge&pg=14&id=EJ1333413&fbclid=IwAR1-OqpU5LEpBmOq09ln7cGtEb43MtRdCRzdJ1yznwSsbYpcJ8nlHI6ul6s_

aem_

AYEzejWiSWgn_jS6gbZSI8TpOxVH7mWBceuJbshr3IO83wa_Ki2Gk

Cb643 v7c1bWXPFlsNiej6rPAoEIUE-KXtlO

Pudjiati, D., & Fitria, T. N. (2022). Understanding technical term translation

using language translator as Mobile-Assisted Language Learning

(MALL). ELT Forum Journal of English Language Teaching, 11(2),

105–114.

https://doi.org/10.15294/elt.v11i2.55448

Putri, R. E., Yusman, Y., & Pratama, Y. W. (2022). Android-Based Learning

Application for Early Childhood Binayah Raudhatul Athfal Foundation.

Mendeley.   https://www.mendeley.com/catalogue/9a1ce413-8980-38e2-8f28-

0fbccf8ab50f

Rocque, S. R. (2022). EVALUATING THE EFFECTIVENESS OF MOBILE

APPLICATIONS   IN   ENHANCING   LEARNING   AND

DEVELOPMENT.

International Journal of Innovative Technologies in Social Science,

3(35). https://doi.org/10.31435/rsglobal_ijitss/30092022/7847

Rodríguez-Díaz, M., Rodríguez-Voltes, C. I., & Rodríguez-Voltes, A. C.

(2018). Gap analysis of the online reputation. *Sustainability*, *10*(5),

1603.

https://doi.org/10.3390/su10051603

Romero, C. a. T., Ortiz, J. H., Khalaf, O. I., & Ortega, W. M. (2021). Software architecture for planning educational scenarios by applying an agile methodology. International Journal of Emerging Technologies in Learning/International Journal: Emerging Technologies in Learning, 16(08),

132. https://doi.org/10.3991/ijet.v16i08.20603

Roshan, R., & Santhosh, A. (2021). Adoption of agile methodology for improving IT project performance. Serbian Journal of Management, 16(2), 301–320.

https://doi.org/10.5937/sjm16-26854

Safieh, A. A., Alhaol, I. A., & Ghnemat, R. (2022). End-to-end Jordanian dialect speech-to-text self-supervised learning framework. Frontiers in Robotics and

AI, 9. https://doi.org/10.3389/frobt.2022.1090012

Sahin, S., & Mete, J. (2021). A brief study on descriptive research: Mendeley. https://www.mendeley.com/catalogue/6d65dc1b-6b8c-3ee7-a8d2-364555d40e0b/?fbclid=IwAR25zSPlpNazflEyQ6ECATFlJSanSvj6YYHDkkI

QrKDpEVTWieHA3SuNPjE

Scopus preview - Sotero, Jaime Hernán Calderón - Author details - Scopus. (2020). https://www.mendeley.com/authors/58765059600

Shadiev, R., & Sun, A. (2020). Using texts generated by STR and CAT to facilitate student comprehension of lecture content in a foreign language.

https://eric.ed.gov/?q=speech+to+text&pg=4&id=EJ1269210

Sharma, L. R. (2023). Choosing appropriate probability sampling designs in

research.   Mendeley.

https://www.mendeley.com/catalogue/c2697b6e-db57-3da5-

a4f5dbefbca17cac

Sileshi, Y., Ayalew, M., & Mulatu, F. (2021). Determinants of the

performance of Logistic Management Information System in the

Ethiopian   Health   Service   delivery   points.   Mendeley.

https://www.mendeley.com/catalogue/785d9e0f-

2f3c-3e30-9165-73b71d5ac558

Soparno, D. R., & Tarjana, S. S. (2021). Students' Perceptions towards Using
Mobile

Application   in   Learning   Speaking.

https://eric.ed.gov/?q=mobile+application&ff1=dtySince_2020&id

=EJ130850 9

Supriyono, S., & Chasanah, N. (2023). SOFTWARE DEVELOPMENT
PROJECT

MANAGEMENT BASED ON WORK BREAKDOWN STRUCTURE

AND ODOO ERP. Jurnal Teknik Informatika, 4(4), 893–898.

https://doi.org/10.52436/1.jutif.2023.4.4.1077

Susantini, E., Isnawati, & Raharjo. (2021). HOTS-Link Mobile Learning
Application:

Enabling Biology Pre-Service teachers to devise HOTS-Based lesson

plans.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&id=

EJ1351

309

Swandi, A., Rahmadhanningsih, S., Nurhayati, N., Arsyad, S. N., Asdar, A.,

Amin, B. D., & Viridi, S. (2021). Development training of Android-

Based interactive learning application as supporting media in online

learning. International

Journal of Public Devotion, 4(2), 52.
https://doi.org/10.26737/ijpd.v4i2.2812

Taherdoost, H. (2022). How to conduct an effective interview; A guide to
interview

design in research study. Mendeley.

https://www.mendeley.com/catalogue/051d5662-76f3-3ba8-b067-

9bea3764f5bb

Tjahjamoorniarsih, N., Putra, L. S. A., Kusumawardhani, E., Pramadita, S.,

& Gunawan, V. A. (2023). An Android e-Learning application to

support academic learning: design, development, and

implementation of a case study. International Journal of Electrical

and Electronic Engineering &

Telecommunications, 12(5), 363–372.
https://doi.org/10.18178/ijeetc.12.5.363-

372

Tamang, J. (2022). Level of Determinants of TVET Career Choice and

Relation to Locale: A study on Diploma level engineering students.

Journal of Education and Research, 12(2), 94–111.

https://doi.org/10.51474/jer.v12i2.627

Torres, E. R., Cano, C. a. G., & Castillo, V. S. (2022). Management

information systems and their impact on business decision making.

Data & Metadata, 1, 21. https://doi.org/10.56294/dm202221

Ullah, I., Kanwal, J., Gillani, F., & Shahzad, I. (2022). Role of Agile

Methodologies   for ensuring quality in Complex Systems: A

Systematic Literature review.

International Journal of Innovations in Science and Technology, 4(4),
1042–

1054. https://doi.org/10.33411/ijist/2022040409

Voshaar, J., Knipp, M., Loy, T., Zimmermann, J., & Johannsen, F. (2023).

The impact of using a mobile app on learning success in accounting

education.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App%20i

n%20colle

ge&pg=3&id=EJ1381909&fbclid=IwAR3XQvPNspkJMOzv87yA

aKx8Peod

WdDH6kODu99AD5kQsqMSknvm3Kbu2sA_aem_AYEWrZQ4aIa_dB

6gW

YufmTweq4kXNsYpMnEyqLCn_lbC_KOgCTf0IiKN4crKCLlisXKhim

wRD hhIsyxx0phnLNZ_

Wibawa, N., & Titik, M. W. (2021). Improve ability and skills of beginning

reading   without spelling by using andriod-based macromedia flash

media application.

Journal   of   Physics   Conference   Series,   1823(1),
012024.

https://doi.org/10.1088/1742-6596/1823/1/012024

Wibowo, D. W., Putri, I. K., & Saputri, L. (2022). Integration of Augmented

Reality and Voice Recognition in Learning English for Children.

Journal of Applied

Intelligent   System,   7(2),   103–110.
https://doi.org/10.33633/jais.v7i2.6119

Wisdhani, Z., Ontowirjo, A. H. J., & Kambey, F. D. (2021). Asmaul Husna
Learning

Application   Using   The   Speech   recognition.
 Mendeley.

https://www.mendeley.com/catalogue/f79ba3fa-2a87-3ace-

97edf272adf1938d

Shehata, S. M., Hegazy, I., & El-Horbaty, E. S. M. (2023). COMPARATIVE
STUDY

FOR ANDRIOD MOBILE STATIC ANALYSIS ALGORITHMS.
Mendeley.

https://www.mendeley.com/catalogue/44392fc6-1526-323b-9047-

66cafab1cd78

Xodabande, I., & Atai, M. R. (2022). Using Mobile Applications for Self-

Directed Learning of Academic Vocabulary among University

Students.

https://eric.ed.gov/?q=mobile+application&ff1=dtySince_2020&pg=2
&id=EJ

1370414

Yadav, A. K., & Oyelere, S. S. (2020). Contextualized mobile game-based

learning application for computing education. Education and

Information Technologies,

26(3), 2539–2562. https://doi.org/10.1007/s10639-020-10373-3

Yusuf, K. (2021). The role of mobile applications in learning Arabic-Indonesian

Translation. Journal of Physics Conference Series, 1933(1), 012024.

https://doi.org/10.1088/1742-6596/1933/1/012024

Yuwono, I., Kusumastuti, D. E., Suherman, Y., Zainudin, Dhafiya, F., &
Rahmatika,

P. (2020). Development of Learning Application for College Students
with

Special   Needs   Using   Universal   Design   for
Learning.

https://eric.ed.gov/?q=Learning+application&ff1=dtySince_2020&id=
EJ1387

987

Zaineldeen, S., Hongbo, L., Koffi, A. L., & Hassan, B. M. A. (2020).
Technology

Acceptance Model' Concepts, contribution, limitation, and adoption in

education. Universal Journal of Educational Research, 8(11), 5061–

5071.

https://doi.org/10.13189/ujer.2020.081106

Zhovnir, M., Shevchenko, O., & Leshchenko, T. (2023). Incorporating

educational smartphone apps for teaching Ukrainian as a foreign

language to medical students.

https://eric.ed.gov/?q=Advantage%20of%20Learning%20App&id=EJ
140012

4&fbclid=IwAR1SKTZw7zlHme3HpmwIYQAz7svO2O_rdYM5IgUkFfq
Hzt

_0SMtOOEJ9m7A_aem_AYFiGiHYD59p3YC0i93PqtVLzimdCTtzL

JniXA0JqXenbkxoibkLIAqlfThfMs5nJDTwhmn

340bA8gkFmlkNZVX