ML-based Meta-Model Usability Evaluation of Mobile Medical Apps

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***Abstract*—Mobile medical applications (MMAPPs) are one of the recent trends in mobile trading applications (Apps). MMAPPs permit users to resolve health issues easily and effectively in their place. However, the primary issue is effective usability for users in maps. Barely any examination breaks down usability issues subject to the user's age, orientation, trading accessories, or experience. The motivation behind this study is to decide the level of usability issues, concerning traits and experience of versatile clinical clients. The review utilizes a quantitative technique and performs client try and hypothetical insight through the survey by 677 members with six distinct assignments on the application's point of interaction. The post-try review is finished with concerning members. The Response surface method (RSM) is used for perceptional and experimental designs. In each case, participants are divided into 13 runs or groups. Experimental groups are involved after checking the perceptions about theoretical usability for different attributes according to the usability model through the questionnaire. The difference is recorded between the perception of users about usability (theoretical usability) and actual performance for usability. The study analyzed through Analysis of variance (ANOVA) that there is a need to improve mobile medical applications but it is also recommended to minimize the gap between the perception level of laymen and the actual performance of IT literate users in context with usability. The experimentation measures the tasks usability of various mobile medical applications concerning their effectiveness, efficiency, completeness, learnability, memorability, easiness, complexity, number of errors and satisfaction. Every design model also produces a mathematical expression to calculate usability with its attributes. The results of this study will help to improve the usability of MMAPPs for users in their convenient context.**

Keywords*—ANOVA; completeness; efficiency; effectiveness; perceptional usability; response surface methodology; actual usability

I. INTRODUCTION

A software program called a mobile application is created to operate on a mobile device, like a smartphone or tablet. The use of smartphones has expanded in many environments like banking, education and gaming including healthcare with many potential and real-life benefits. The younger generation becomes technically competent medical professionals. According to statistics, more than 36% of the world's population was using smartphones in 2018, up from about 10% in 2011. As the 2020 analysis shows, one of the Asian countries has approximately 82 million Internet customers, and the industry will exceed US$10 billion. In third-world countries, the proportion of individuals who own a mobile phone is even higher (75%) [1].

In January 2021, there were 61.34 million online customers in third-world countries. As of January 2021, the country has 173.2 million mobile associations. From January 2020 to 2021, the quantity of cell phone users in the nation expanded by 6.9 million (+4.2%). January 2021. In January 2021, the quantity of public compact affiliations is identical to 77.7% of the complete populace [2]. From a usability point of view, medical institutions have introduced the use of Internet technology to meet the needs of patients and improve their services, but this phenomenon is still in its infancy [3]. The most popular Internet service is the mobile medical application. Usability plays a significant part in the product improvement process. In the field of Human-Computer Interaction (HCI), the most generally acknowledged meaning of usability is that proposed in ISO 9241-11: "the degree to which a client can utilize an item to accomplish exact goals with efficiency, effectiveness and satisfaction in a setting of determining use ". Then again, in the field of software development, the most generally acknowledged meaning of usability is that proposed in ISO 9126-1 [4] "the capacity of the product item to be perceived, learned worked and alluring to the user when utilized under determined conditions ". Starting here in view, usability is considered a particular element that influences the nature of a product item; it doesn't be guaranteed to infer client interaction with the framework since it is very well may be estimated as "consistency to the determination". After indulging the efficiency, effectiveness, learning ability, reliability, safety, error-freeness, enjoyment and other factors of MMAPPs, it is of great benefit to provide a new and convenient way for the online mobile medical field [5]. Most of the users feel uncomfortable and dissatisfied with online medical treatment and consultation because MMAPPs are may not user-friendly. This is a new concept in developing countries such as Asian countries. Usability is also described as "the degree to which a specified customer can use a product to achieve specified goals in a pre-defined usage setting with feasibility, productivity, and realization" (ISO 9241-11, 1998) [6].

Health is wealth; this is an important lesson, especially considering the recent coronavirus outbreak. This deadly virus spread so fast that the entire city was abandoned to maintain it. This virus tells us that the study needs to connect the health system, and need to be more technically focused on identifying and treating such diseases without going outside in public places with the help of MMAPPs. Most of the functions performed by mobile medical apps are checkup waiting time, online patient evaluation, feedback, medical history, self-medication, first aid information, guidance to reach the hospital, simple payment method/simple payment, run-time diagnosis after entering symptoms, and variety of input methods (as this is the case of the patient), check the availability of specialist through cloud computing, sample collection facility, find a doctor, and set an appointment for a doctor. The most irritating thing is the hanging tight for specialists or the clinical benefits. According to the occupied cycle, the people groups can't bear the cost of hanging tight for the specialist or clinical benefits. Giving this information will show on the profile of the specialist how long you should hold back to get inspected or get any clinical benefit according to my perspective this one is the more charming element. MMAPs can achieve this after providing all functionalities [7].

This paper discusses the usability of mobile medical apps, reviews the literature, and discusses usability models, features, selections, and user-centered models. It includes research methodology, questionnaire selection and sampling, Central Composite Design I and RSM Experimental Design II results, compares the results, analyzes them and concludes with implications.

A. Contributions

- The study provides the ANOVA-based usability evaluation of mobile medical apps.
- The study calculates the perceptional usability and actual usability of mobile medical apps.
- The study provides the usability calculation formula with nine attributes of usability which can be used to calculate the usability of any of the mobile medical apps.

II. Literature Review

The study explains the speedy growth of mobile users, there's an outstanding boom in mobile software users. Therefore, the preservation of cellular users and producers of mobiles increases processing power, storage, functionalities and offerings. Now there may be a task for builders, software program engineers and interface designers to play their element in context with usability to retain cell utility users. The motive is that every category of cellular packages like enterprise apps, schooling apps, leisure apps, clinical apps, Travel apps, software apps and social media apps has its own practical and non-functional needs [8].

The usability analysis of mobile apps is executed on the idea of the four maximum popular attributes which can be efficiency, effectiveness, usefulness, and accuracy. Analysis of this study explains that usability evaluation of some other cellular utility may be carried out with the help of these four characteristics only [9].

The given examination evaluation suggests that social elements are extra effective in the reputation and usability of cellular packages. The have a look at is restrained due to the fact carried out only extracted facts of crowd sourced web packages. Due to human computations and tiny date units from only new jobs, validity and verification are sometimes jeopardized [10].

Its first degree used a user-targeted layout for customer's duties; the second degree examined usability with laboratory settings and third level usability assessment was performed in a real-world environment. As a result, it offers many usability evaluation strategies. Mobile utility builders can select first-class one or extra in keeping with the scenario [11].

The research evaluated the usability of mobile apps using 36 criteria to create applications that are centred around people. This look used three methods for reliable assessment; the methods are QUIM, mGQM, and GQM. According to participating specialists, the effects performed from this assessment are dependable and validated with the help of metrics [12].

The paper explains that cell applications need extra attention as compared to large display computers like laptops or desktop systems since mobiles have a small screen with ongoing warnings. It would be ideal for it to be simple and more clients lovely. A limit of the cell programs is assessed in a usability setting with ascribed productivity of one hundred%, adequacy of 96%, and pride of 87%, yet memorability, learnability, straightforwardness and mental burden are not assessed [13].

As per an examination, clients of portable and its programs developing quickly as there are 4.57 billion cell phone users. Those buyers use 175 billion projects/. This investigation presents the UCD form with usability credits as viability, execution, pride, understandability, blunders, and availability [14].

According to the report, most developers don't pay close attention to usability factors like accessibility and learnability most of the time. Mostly smart software engineers and interface designers are involved with effectiveness and satisfaction however they are not with user-side error safety Hamid et al. [15]. It also discusses 27 problems of usability, suggestions for them, and guidelines for those issues so that it will be beneficial for developers and researchers [16].

This study investigates the usability evaluation process of mHealth apps using a Systematic Literature Review. Results show that a mixed-method approach can improve reliability and satisfaction. The study encourages developers to design more user-friendly applications, especially for older adults and novice users, to improve the effectiveness of mHealth apps [17].

The study presents a methodological approach for developing a usable mHealth application using a three-level stratified health information technology usability evaluation framework. The methodology includes a card sorting technique

for user-task guidance, end-user testing and heuristic evaluation with experts, and real-world evaluation after a three-month trial. The case study illustrates the use of these methodologies. The three-level usability evaluation was used to explore user interactions, refine app content, and use a stratified health IT usability evaluation framework for mHealth app design, development, and evaluation, providing methodological recommendations for future studies [18].

III. METHODOLOGY

The motivation behind this exploration is to investigate and foster comprehension of basic worries blunder-free, disappointment-free, more usable and best executable m-medical applications because the patient can't afford any misconception due to horridness [19]. This Idea will be founded on quantitative request. It is the orderly experimental examination of detectable peculiarities employing measurable, numerical, or computational techniques [20]. This examination contrasts client thinking with comprehending the convenience of versatile medical applications with specialists thinking based on gathered information and proposes the best technique and ideas for improvement of MMAPPs later investigated over chronicled data, and standards of conduct and made accessible to the exploration community [21].

A. Usability Model

Model Produced with the help of the following attributes under consideration.

B. Awareness (Interestingness)

The rising fame of mHealth is a promising and open door for torment self-administration. Versatile applications can be effortlessly grown, however understanding the plan and usability will result in applications that can hold more clients. This exploration targets recognizing, breaking down, and orchestrating the present status of the specialty of (a) the planned approach and (b) usability appraisal of agony the executive's portable applications [22].

C. Complexity

Complexity analysis based on screenshots of the user interface in addition to interaction information, textual content size, font, language, or character set, homogeneous background and contrasting color without the want to get entry to the source code of the utility. In contrast, applications provide easy navigation and without blind flow [23].

D. Easiness

An important concept that illustrates how well users can use a mobile application is the ease of use. Design engineers define specific KPIs for each project like "Clients should be able to tap Find within three seconds of reaching the point of interaction on the application interface" and "usability should be streamlined while providing the greatest usefulness and considering business constraints." [24].

E. User Satisfaction

Fulfillment can be accomplished in three ways. As a matter of first importance, interface text or content should esteem the patient in setting with the significance of the patient and accomplishing the objective of the patient through the application. Furthermore, the point of interaction should direct the patient through the task for which the individual in question utilizing it [25]. Thirdly various assignments for finishing an exchange/accomplishing an objective ought to be well organized [26].

F. Efficiency

The productivity of portable medical applications is assessed three correspondingly, as a matter of first importance either concerning application plays out the particular undertaking totally, precisely and brief time frame. Also, either concerning application load and login or logout in the brief time frame as indicated. Thirdly, whether the unsettling application is viable to different mobiles and human-PC association aptitudes [27].

$$\text{Time} - \text{Based Efficiency} = \frac{1}{N}\sum_{i=0}^{N}\frac{n_{ij}}{t_{ij}} \quad (1)$$

where, N= No. of Jobs, R= No. of Contestants, nij = Job I's resulted by j's participant, and tij = Participant I's time to Complete a j Task.

Eq. (1) calculates the time-based efficiency with the help of each total number of tasks completed by each participant in a specific time and divided by the number of jobs.

G. Effectiveness

Before you start to arrange Effectiveness is estimated with the assistance of consistent appearance applications, either interface configuration has significant choices and fastens more noticeable, lucid and simple to get to. Furthermore, either client moves around various choices effectively and sensibly to explore versatile medical applications. Consequently, the viability is a mix of Logical appearance and navigation of the UI of versatile apps [28].

$$\text{Effectiveness} = \frac{Total\ Number\ of\ Tasks\ Completed\ Successfully}{Total\ Number\ of\ Tasks\ Undertaken} \times 100 \quad (2)$$

Eq. (2) calculates the effectiveness of different medical using programs that divide the total number of activities completed by the total number of tasks attempted and multiply the result by 100.

H. Memorability

The idea of memorability, from the usability point of view, is that a client can leave a program and when the person gets back to it, recall how to get things done in it. Memorability is significant generally because clients may not be utilizing your application constantly. It is easy to recall a task which is previously performed and reconnect the user after a long time [29].

I. Learnability

Learnability property signifies "How simple is it for the people to figure out how to utilize the framework". It tends to be accomplished assuming our product point of interaction is basic and has routine likenesses to the next application. People are not working any harder than needed to utilize innovation and try to avoid absolutely special software as individuals gained from past experiences. Various people have distinctive

trouble levels; it is likewise an observable highlight to accomplish/assess the learnability normal for portable medical apps [30].

J. Completeness

Completeness means checking the application interface for style, buttons, navigation and task completeness, etc. As a result of the backward point of view of the UI versus the prerequisites, presented, it can re-decipher task culmination also. The inquiry assumes there are relations in the model, i.e., i.e., rules which oversee changes between states. In legitimate dialect, it needs to have the option to inquire as to whether the framework is finished. The difficulties of these rules closely match the ones which relate to task plumpness [31].

K. Selection of Medical App Features

The study initiates a systematic study of the characteristics of more usable mobile medical apps and their impacts on the cyber world, and medical industry. The study compares different mobile medical apps for seven features 1) Find a Doctor, 2) Set an Appointment, 3) Sample Collection Facility, 4) Medical History, 5) Feedback and 6) Online Patient Evaluation, and proposes the best mobile medical apps with the use of a questionnaire instrument, the post-test is also carried out. Verification and validation of results have been carried out based on real-time data [32].

L. User Center Approach

The User Centre Model (UCD) is a research technique that improves versatile applications by reinforcing their convenience and decreasing expense as seen in Fig. 1. The fundamental objectives of the UCD model are fulfillment, essential, learnable, compelling, proficient, and adjustable design or interface for the users. In this model collect the requirements from users, then develop designs accordingly through RSM, calculate usability attributes of perceptional usability, and IT User's usability and combine usability with the help of experiments on 13 runs or groups of users. The study evaluates and compares the results of perceptional usability, IT user usability and combined usability. After the analysis study produced coded equations or formulas for calculating usability.

Fig. 1. User center model.

M. Reason for the Model Used

The study works with nine attributes of the usability for evaluation of mobile medical apps. The study provides the perceptional-based evaluation of usability version and actual means performance-based evaluation of usability and both are evaluated through ANOVA. At the end compare results of both evaluations.

IV. Selection and Sampling

The usability testing was driven at various university campuses and after filtration 677 individuals enlisted for the examination performed for twelve highlighted MMAPPs regarding interface for 6 features due to the availability of relevant participants and apps. The study divided the participants into 13 runs or groups starting from run 1 up to run 13. Each group was assigned several tasks according to RSM based design model for assessing and evaluating the usability of each feature concerning effectiveness, efficiency, learnability, memorability, completeness, easiness, complexity, number of errors and satisfaction [33].

A. Questionnaire

The questionnaire is developed with the help of the System Usability Scale (SUS) and Post-Study System Usability Questionnaire (PSSUQ) and gathers data about nine attributes of usability from 677 participants. In this study five points grading scale is used from strongly agree to strongly disagree on the other hand mid-point is agree. The study assessed the ease of use, ease of learning, simplicity, effectiveness, efficiency, ease of memorable, awareness, completeness, information and the user interface [34].

There are two design models are applied in the study for calculating perceptional usability and combined usability, after applying the questionnaire and performing the experiment respectively.

V. Results and Discussion

The RSM (Response Surface Methodology) technique is used in this study to validate the usability model.

A. Central Composite Design I (Perceptional Usability)

Table I represents different attributes of usability, their effects on usability and their response to perceptional usability

Table II shows variables, and their levels like minimum values, maximum values and mid values for all attributes of usability defined in a usability design.

Fig. 2 shows that validation of the model is done with the help of relationships and the effect of different attributes on usability given in the diagram. As seen from the above figure almost all the attributes of the concerning model affect usability. Some attributes have a greater effect and few have a little effect which is also shown in Eq. (3).

Table III shows the ANOVA model regression coefficient and analysis of variance which is significant and the lack of fit insignificant as required for the validation model.

TABLE I. ANOVA-BASED FACTORS AND THE RESPONSE OF PERCEPTIONAL USABILITY

Run	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Response 1
	A: Awareness	B: Complexity	C: Easiness	D: Satisfaction	E: Efficiency	F: Effectiveness	G: Memorability	H: Learnability	J: Completeness	Perceptional Usability
1	2.1	2	2.2	2	2.6	2.2	2	2.4	2.3	55
2	2.33	1.87	2.53	2.67	2.6	2.47	2.2	2.6	2.27	59.81
3	2.26	1.87	2.55	2.45	2.41	2.53	2.24	2	2.09	58.07
4	2.42	1.95	2.52	2.58	2.52	2.57	2.29	2.55	2.02	59.01
5	2.43	1.9	2.5	2.57	2.73	2.37	2.67	1.83	2.57	59.91
6	2.23	2.1	2.46	2.43	2.57	2.34	2.2	2.6	2.11	57.86
7	2.24	2.1	2.53	2.42	2.39	2.51	2.2	2.48	2.07	58.01
8	1	2	2	2	3	1	2	4	0	47.22
9	3	2	4	4	4	3	3	4	3	83.33
10	2.52	2.16	2.8	2.88	2.72	3.04	2.56	2.72	1.92	64.78
11	3.08	2.08	2.84	3.12	2.8	2.84	2.48	2.84	1.72	66.11
12	2.42	1.95	2.52	2.58	2.52	2.57	2.29	2.55	2.02	59.01
13	3.08	2.08	2.84	3.12	2.8	2.84	2.48	2.84	1.72	66.11

TABLE II. LEVELS OF INDEPENDENT VARIABLES

Symbol	Independent Variables	Minimum Value	Mid Value	Maximum Value
A	Interesting (Awareness)	1	2.38	3.08
B	Complexity	1.84	1.97	2.16
C	Easiness	2	2.64	4
D	Satisfaction	2	2.68	4
E	Efficiency	2.39	2.75	4
F	Effectiveness	1	2.47	3.04
G	Memorability	2	2.36	3
H	Learnability	1.83	2.73	4
J	Completeness	0	1.99	3

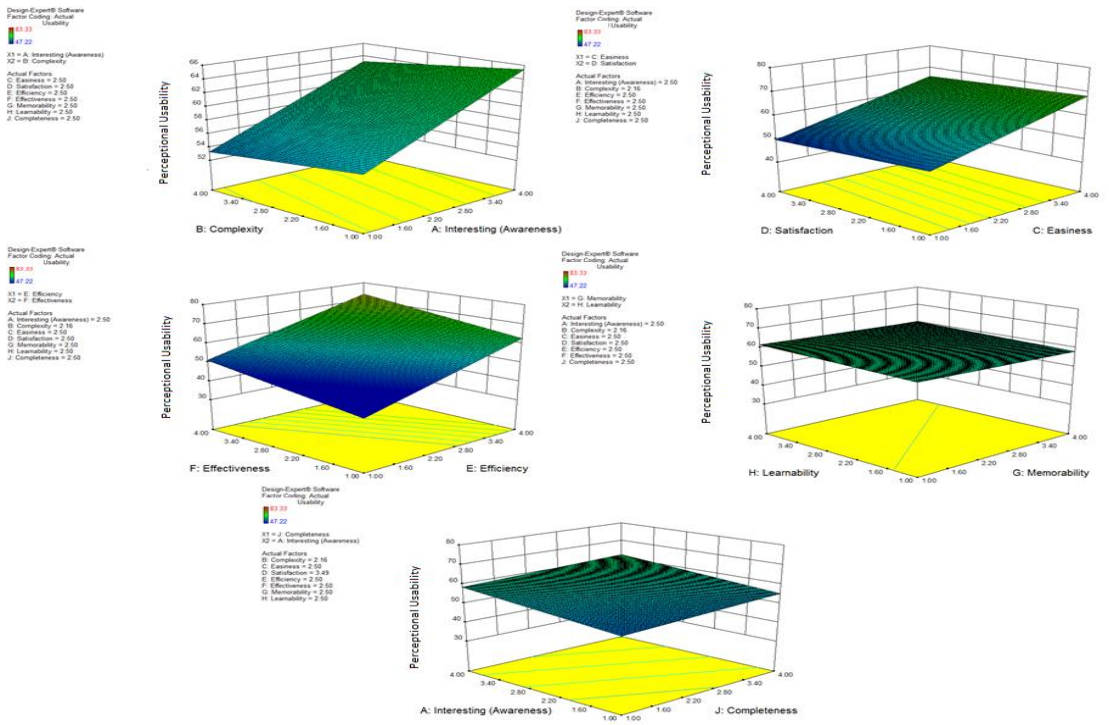

Fig. 2. Relationships and effects of attributes on perceptional usability.

TABLE III. RESULTS OF REGRESSION COEFFICIENTS AND ANALYSIS OF VARIANCE FOR ONE RESPONSE VARIABLE BY ANOVA

Source	Intercept (β_0)	A-Awareness	B-Complexity	C-Easiness	D-Satisfaction	E-Efficiency	F-Effectiveness	G-Memorability	H-Learnability	J-Completeness	*P*-Value	F-Value	R^2	Adj. R^2	Lack of Fit
Theoretical-Usability	59.36(Significant)	4.91	-1.13	8.12	-1.69	11.09	7.92	-0.72	1.42	1.75	<0.0001Significant	263.13	0.978918	0.975198	0.8551(Insignifican)

B. Analysis via Perceptional Design I

As seen in Fig. 3. Under half of the mobile patients have high and extremely high fulfillment levels on versatile medical applications. Over 59% of people said that mobile medical apps are too complex. Complexity is inversely related to usability. The vast majority of IT users and doctors said that current MMAPPs are successful, productive and easy to use but a small number of general users feel much easier. The graph shows that easiness is directly related to usability. The majority of the MMAPP's users think that these applications are satisfactory which is related to usability as seen from the graph. As seen in Fig. 1. little more than 50% of mobile medical application users think that these apps are efficient. The remaining of them think that more efficiency is needed. Efficiency is directly linked with usability as seen from the graph. 50% think effectiveness is necessary but the remaining do not think so. The graph shows effectiveness is a little bit related to usability, learnability and memorability are also directly linked with usability but have little effect on it.

$$\text{Perceptional Usability} = 59.36 + 4.19A - 1.13B + 8.12C - 1.69D + 11.09E + 7.92F - 0.72\text{G} + 1.42H + 1.72J \quad (3)$$

Eq. (3) represents the perceptional usability deduced from the ANOVA model after analysis. This is a general proposed formula of perceptional usability that can be used for the calculation of any sample of the study.

C. Experimental Design

This test was overseen on university campuses where all members were grown-ups. The individuals were facilitated to perform 13 activities, for instance, the tasks were organized and executed for class length in the college. The ordinary task completion time was eight minutes [35].

D. RSM Experimental Design II (Experimental Usability)

Table IV represents different attributes of usability, their effects on usability and their response to combined usability. There are 13 runs in which the specific number of participants is included according to the RSM design model from which particular tasks are performed to calculate and evaluate the attributes like effectiveness, efficiency and satisfaction. On behalf of these attributes, usability is calculated and the equation of combined usability is deduced.

Table V shows variables that represent the attributes of combined usability and their levels like minimum values, maximum values and mid values. This table also represents the standard deviation faced by given attributes in an RSM model.

TABLE IV. ANOVA-BASED FACTORS AND RESPONSE AS ACTUAL USABILITY

Run	Factor1	Factor2	Factor3	Response1
	Effectiveness	Efficiency	Satisfaction	Usability
1	82.93	75	50	69.31
2	57.63	83.33	66.67	69.21
3	85.44	84.12	61.18	76.91
4	81.71	84.12	63.55	76.46
5	58.46	63.33	63.33	61.71
6	72.33	70.14	60.71	67.73
7	80.03	81.74	61.18	74.32
8	75	75	50	66.67
9	50	100	100	83.33
10	69.32	72	72	71.11
11	65.9	72	71	69.63
12	81.59	87.06	63.55	77.4
13	59.47	60	70	63.16

TABLE V. LEVELS OF INDEPENDENT VARIABLES FOR EXPERIMENTAL DESIGN

Symbol	Independent Variables	Minimum Value	Mid Value	Maximum Value	Std. Dev.
A	Efficiency	50	74.99	85.44	11.15
B	Effectiveness	60	87.3	100	10.27
C	Satisfaction	50	65.63	100	11.89
R1	Usability (Actual)	61.71	75.97	83.33	6.14

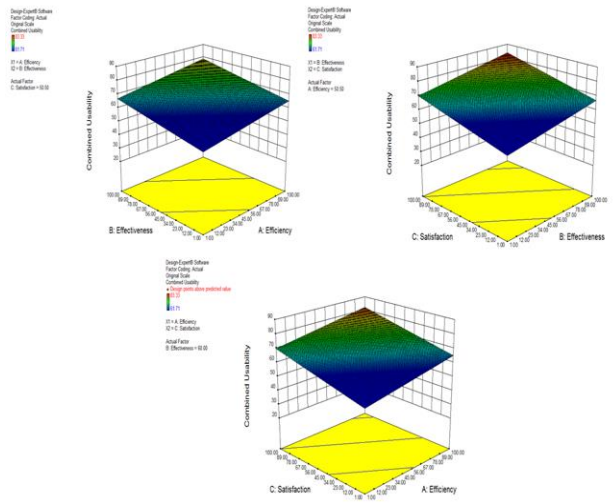

Fig. 3. Relationship and effects of attributes on combined usability.

TABLE VI. RESULTS OF REGRESSION COEFFICIENTS AND ANALYSIS OF VARIANCE FOR THREE RESPONSE VARIABLES

Source	Intercept (β_0)	A-Efficiency	B-Effectiveness	C-Satisfaction	AB	AC	BC	A^2	B^2	C^2	*P*-Value	F-Value	R^2	Adj. R^2	Lack of Fit
Actual-Efficiency	7.12(Significant)	1.13	1.12	1.12	-0.13	-0.11	-0.12	-0.059	-0.045	-0.053	<0.0001	1.014E+008	1.0000	1.0000	0(Insignificant)

Fig. 3 shows that validation of the model is done with the help of relationships and the effect of different attributes on combined usability given in the diagram. As seen from the above figure almost all the attributes of the concerning model affect usability. Some attributes have a greater effect and few have a little effect which is also shown in Eq. (4).

Table VI shows the ANOVA model regression coefficient and analysis of variance which is significant and the lack of fit insignificant as required for the validation model.

$$\text{Combined Usability} = 7.12 + 1.13A + 1.12B + 1.12C - 0.13AB - 0.11AC - 0.12BC - 0.059A^2 - 0.045B^2 - 0.053C^2 \quad (4)$$

Eq. (4) represents the combined usability deduced from the ANOVA model after analysis of data gathered from activities performed by participants.

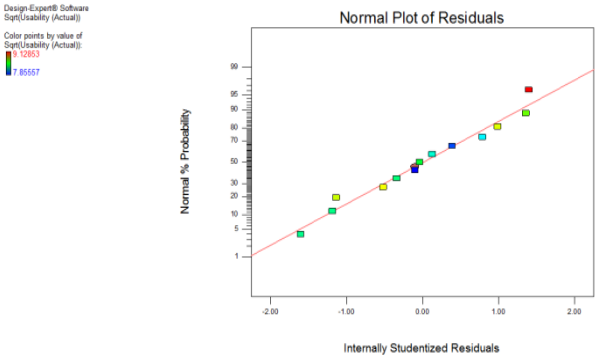

Fig. 4. Normal probability.

Fig. 4 shows that all values of usability are normally plotted on or near the normal line. Its mean ANOVA model and RSM design are significant.

E. Comparison between Theoretical and Actual Usability

Fig. 5 represents the variations and comparison of perceptional usability, IT user usability and combined usability. According to IT users and experts, the usability is very close to the standard usability, combined usability is below the standard usability and users think that there is much need for improvements in the usability of MMAPPs.

F. Analysis via Experimental Design II

For this reason, 677 individuals concurred with the examination performed for twelve elements of mobile medical applications regarding point of interaction. The studies posed various inquiries about convenience assessment in settings with easiness, learnability, memorability, adequacy, productivity and satisfaction [36-37]. The study uses Google Forms for gathering their reactions because of the coronavirus pandemic, likewise, lead Zoom meetings for direction about this review and top of the reactions. The study additionally guides through SMS, WhatsApp messages and calls to our IT specialists and investors about the survey on Google Forms [38]. Fig. 5 shows that improvement is required in all the attributes of usability as every group or run has usability value in the range of 50 to 64 for combined users, less than 60% for illiterate users and an average of nearly 75% for IT people. As per the above outcomes and conversation, there is a lot of progress expected to foster completeness and efficiency and reduce the complexity of MMAPPs. From the above conversation obviously, there is a hole among users, user perception level and application developers in setting with convenience which ought to be taken out by understanding the necessities and prerequisites of the users [39-40]. There is additionally an idea during advancement that the study might present the mode idea as designer presented in another application programming like Master Mode for doctors, User Mode for illiterate users and Well-disposed Mode for IT users.

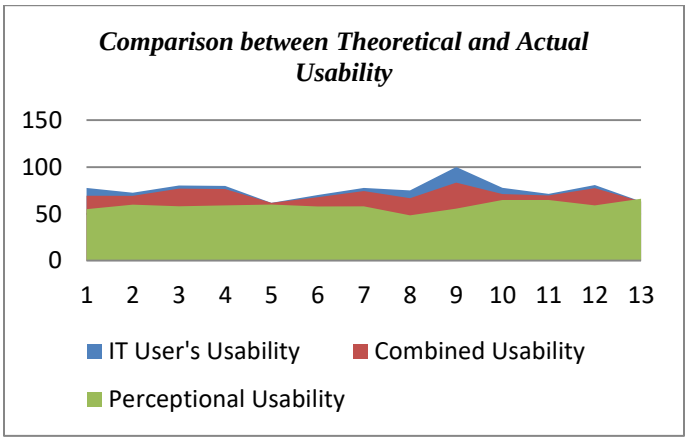

Fig. 5. Comparison between IT users' perceptional and combined usability.

G. Analytical Suggestions

From the above conversation and information assembled, the study ought to likewise give all elements of medical in medical mobile applications for the fulfillment and viability of MMAPPs and conduct pieces of training for MMAPP's users. As indicated by the specialist's assessment and information accumulated from users, there are three segments, where upgradation is required which are complexity, efficiency and completeness.

H. Limitations

- The study took samples from one country, it may be extended worldwide.
- This study uses nine attributes of usability, which may increase to get more precision level.

VI. CONCLUSION

Healthcare is evolving as the industry undergoes significant change. It is simple and advantageous for patients to adopt a healthy lifestyle by using mobile medical apps. The study worked on perceptional usability with the newly introduced UCD model with different attributes and checked their effect on usability through RSM designed model. Then analyzed and validated the model by ANOVA. On the other hand, traditional usability attributes are checked in a new form through the second RSM design model for IT users and combined user usability. It also checked the effects of attributes on perceptional and IT users and combined user usability as shown in Fig. 2 and Fig. 3. In the last compared these usability results of different groups of users according to the given design model. The deduced results of this review show that it is vital to think about patient fulfillment and confidence in MMAPPs for the future improvement of versatile medical application interfaces. Less than 50% of smartphone users utilize mobile medical applications (other than experts) to perform medical-related tasks for maintaining a healthy lifestyle. For this purpose, improve the awareness, make it much more interesting and enhance satisfaction, completeness, efficiency and easiness level of MMAPPs for users. The relationship between the average usage of medical applications and user health is statistically significant. A large number of participants agreed that medical applications can help to improve their health and as well as a healthy environment. It is necessary to limit the gap between patients/users and specialists for the improvement of MMAPPs. The last one is the expansion of all medical elements to further develop user fulfillment and user accommodation. There is no need to make many secure and complex MMAPPs like banking apps and security apps etc. At the end of the analysis, each design model produced a mathematical equation to evaluate its usability.

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