Dynamic Detection of Cyber Security Attacks in IoT assisted Cloud Computing Based Health Environment Using Big Data Analysis

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Abstract: Most ecommerce companies have their receive to pay process as predominantly manual, leading to non-reliability of payments & delayed visibility for sellers and requirement of additional manpower for scaling up for buyers. With the correct image and pdf processing tools, it is possible to automate this process for more efficient and cost-effective results. The research paper focuses on automating the task of invoice processing which is predominantly done manually. The idea is to save time, effort, and costs while eliminating human errors from the process. There are several existing image and pdf processing tools of which we will discuss pdftotext, tesseract and tesseract4.

KEYWORDS: Image Processing, Electronic invoicing, pdftotext, tesseract, tesseract4

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I. INTRODUCTION

With rapid growth of the aging population, the significance challenges to address safety health of older adults started extremely high [1, 2]. There is a huge demand in medical healthcare services to take care elderly people even in homes and hospitals. In most cases elderly people suffer from severe health related issues when compared with other normal and middle aged people. That is elderly people find it difficult to take care of themselves, also nurses and their families fail to provide proper care when they need medical assistance. Sometimes people fail to remember the doctor's prescription, miss the correct time to do check-ups and give tablets. Money also plays an important part in taking care of an elderly people at home and hospitals. The financial situation will make the elderly people condition even critical as they fight for unreasonable causes. This has been solved by using a technology called wearable medical devices [3]. Recently there are a number of wearable devices available in the market to assist the elderly people with utmost care and respect.

The wearable devices automate the unpredictable causes of elderly people by treating them or finding the reasons in no time. The smart wearable devices allow the elderly people to get signs or know the causes of various problems like checking heart condition, blood pressure, sugar test, thyroid test, fitness test, etc. These devices will allow getting treatment earlier if the elderly patients need immediate treatment. The results from the devices are accessed by doctors from the hospitals using cloud internet platform services [4]. The real-time sensors will act as the wireless sensor network in sending the patient information to the hospital server. We can also use wearable devices at home in an emergency situation. Additionally, it will reduce travelling time and cost for monthly or weekly physical checkups. Hence wearable devices are more important in maintaining the safety of health either inside or outside of home.

In early days a wearable health monitoring system was designed to record and monitor the deficiency of human body signs of elderly people, which also suggest the nearby hospital to get immediate treatment if the patient is in need of medical assistance [5]. The e-medical service centres will provide medical help by professional medical doctors through mobile phones. They also suggest suitable medicines with home remedies and reducing the travel cost [6]. Increase in technology with the number of processing communication such as mobile services (Bluetooth, wifi, 5G) with cloud computing, artificial intelligence results in a variable number of wearable internet of things (WIoT). All these wearable technologies have been applied in many fields such as sports, military, labs, research, health etc. Still a lot of experiments are undergoing for solving various health related issues by many researchers. The wearable devices are specifically designed to act as a need of assistance from anywhere. Also this wearable medical accessible kit will be easily buyable at an affordable cost.

The important wearable technologies in the current environment as supported by sensor networks and electronic devices are implemented by using sensors, networks, surveillance cameras, actuators, controllers, specific health model, evaluation and prediction, finally decision system [7]. The applications created by many medical and research professionals are used to monitor the symptoms and signs by measuring the body of a specific region. The types of wearable systems are given in Table 1. It shows the important physical signs of symptoms while measuring using smart devices.

Table 1 Physical Signs Measured by Smart Wearable Systems

Physical signs	Sensors	Observations
Electrocardiograph (ECG)	Skin electrodes	Heart rate, heart rate variability
Electroencephalogram (EEG)	Scalp-placed electrodes	Electrical activity of brain, brain potential
Electromyography (EMG)	Skin electrodes	Muscle activity
Blood pressure	Cuff pressure sensor	Status of cardiovascular system, Hypertension
Blood glucose	Glucose meter	Amount of glucose in blood
Galvanic skin response	Woven metal electrodes	Skin electrical conductivity
Respiration	Piezoelectric sensor	Breathing rate, physical activity, inspiration and expiration
Temperature	Temperature probe	Skin temperature, health state
Activity, mobility, and fall	Accelerometer	Body posture, limb movement

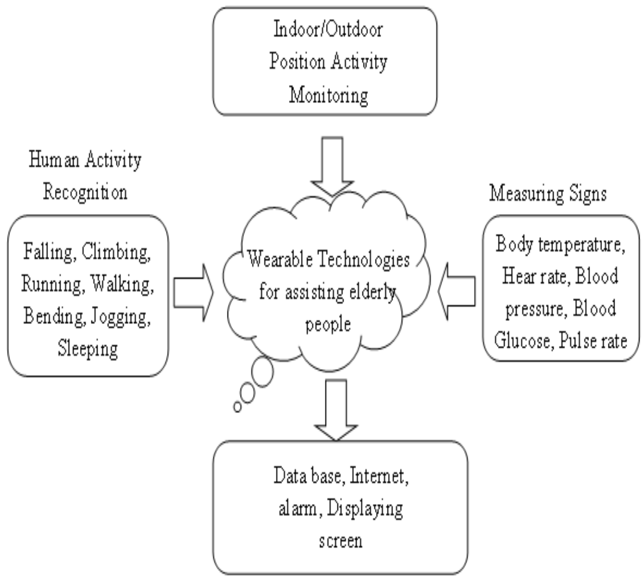


Fig. 1 Wearable Devices in DifferentEnvironment

There are many kinds of devices used for measuring the health issues of elderly people with embedded wearable technologies. Some of the devices are smart watch, mobile app, smart phone, online computer, smart dress, smart glass etc. Among these devices smart mobile phones are more attractive to many people. Because, mobile phones can be carried everywhere along with them everywhere they go [8]. Machine learning algorithms are analysed by several researchers to analyse large amount of data and improving the performance of the detection rate in several fields [9] [10]. The general schematic diagram of wearable devices in taking care of elderly system is given in figure 1. The main technological purpose of this system is monitoring indoor physical activity and updating the physical status. The wireless sensor network will be used to track the position of people in real time. Also the software programming will be used to collect the data, extract the features, design model and make the system recognizable. The integrated sensors will act as the prototype of the network system to find the signs and make decisions quickly.

II RELATED WORK

This work, based on the technologies for the elderly people who are facing stress and complexity to lead their populated without illness. Lensoff - CaravagliaanalysedGerontechnology, dealt with elaborating the situation of the adults surviving in the home, their interaction, flexibility, facing problems and the health condition. They focus on describing the individualistic appeal in the organization in the regular days. It helps to identify the diseases with different medical technologies to overcome the problems during the aging person [11]. In [12], Assistive Technology (AT) is proposed to compare the age group between younger people and elder people with the attitudes of health and flexibility. Elderly people are divided between 72 and 81 age group; it yields to carry all the results for their user's behavior. Once the elderly people find difficulties with their health, immediately they prefer for the AT to get the benefits from the sickness and deformity from frightening of the problems.

In [13], the communication heritage condition reaches the new authorization and was developed to measure, provocation and give out the "native" tradition. This mediated communication technology is proposed to distribute the structure of elements that assist the consideration of the communal system, new design, and spectators. It supports the AT for all the communication in the environment for adult's health and follows the interactive adoption model. In [14], demonstrates the usage of the email to communicate with the 18 groups to resolve the innovation and prompts by the old age people. They innovate how it is possible to learn about new ideas for the old era. Is it acceptable by the adult's to adopt the users by the communication methods? Hence the internet demands the cost for all usage of the technology that was adopted by older people.

This paper contributes to the Technology Acceptance Model (TAM) to examine the adoption of the internet by the Chinese older adults and how they are involved in their different features. Proposed method is used for the resolution to estimate the senior in younger and elder involvement for comparing different factors with the TAM model. It consists of many features and factors such as facilitating conditions (FC), perceived ease of use (PEU), Perceived usefulness (PU) and subjective norm (SN) [15]. Leyla Dogruela suggested that new – media purposes are elaborated to describe the user's entertainment to elderly people. They are supposed to accept the new technology based on the TAM structure. Elderly people planned to analyze the two concepts to use the 3D pictures for 50 age people and they work out the evaluation done for the computer game for the same age people. It made them accept the entertainment media technology for their mind-set to be involved in the enjoyment [16].

Senior Technology Acceptance Model (STAM) was developed to finalize with 1012 seniors aged 55 by the Hong Kong Chinese people. These people accept the gerontechnology based on STAM to gain the health information and features of theories of the age group. It observed 68% of different can be identified with the term gerontechnology. It assists to prognosticate the state of the age, gender, instruction, health details, the status of the diseases, number of affected technology, age-related health care [17]. In 2018, wearable devices are implemented with traditional Chinese medicine (TCM) for detecting the elderly health condition. They used the diagnosis instrument to obtain all the information on the diseases or reports of the patients. Also, researchers proposed the Analysis of Variance (ANOVA) for changing the adoption of the changes between the people's health statement. It diagnoses the status of elderly people before and after the usage of wearable devices and without changing the information for detecting pulse duration [18].

Nelson and Dannefer demonstrated that heterogeneity is improved high when the age increased and potential is contrasting for older adults. TAM analyzed that the elder's features are similar in their strength and convergence [19]. In [20] [21], devices are estimated to the adults for the hearing and vision disabilities in the text-based or graphical images. It is determined by using the mobile phone, digital camera, CD, MP3 player, alarms, pen drive etc to be supported for the elderly people as wearable devices. Ling (2013) [22] proposed an approach that the elderly people cannot find the exact movement and very slow in finding the activities such as writing a stylish letter, opening small targets, touching the small button. It is due to the diminishing of the touch thoughtfulness and conscious mental activity. In [23], about 50, 60, 70 age people compared with younger people. Elderly 50 age gave the result as 40%, 60 age peoples gave 40%, 70 age gave 20% and the younger age gave 57% engaged in the sampling rate from all people in Germany. They detect elderly women have more than males, whereas n = 125, female results as 54% and male results as 46% as per the observation.

Pan and Werner initiated that the older people from high-level status with higher education are dependent on the gerontechnology and suggest male candidates use better than the female candidate. In 2010 - 2011, aged people evolved PEOU, PU and AT for the observation of attitudes and lifestyles of the genders. It is also related to TAM to get the anxiety and flexibility of the action and much recent technology used for elderly people all over the world [24]. The wearing tags are used to recollect user acceptance in the environment for elderly people's care. They must use the 2 – dimensional systems with a better rate of 0.5m and 1 m with accurate "user Acceptance". The wearable devices measure the elderly care by the system such accuracy (0.5 to 1 m), complexity during installing (less than 1 h), Not spread quickly, coverage area with 90m, sampling interval (0.5s) and the system is always accepted with availability [25].

Thota, C presented an efficient and secure centralized architecture for end to end integration of IoT based healthcare method deployed in Cloud environment. Sensor data is collected for health purposes, and the sensor data is safely communicated to near-edge devices. Finally, gadgets send data to the cloud, where it may be accessed by healthcare experts at any time. The major goal of this project is to ensure that all devices' authentication and authorization are safe [33]. Since then, sensors have become increasingly important in a wide range of applications, including environmental monitoring, transportation, smart city applications, and healthcare applications, among others. Wearable medical devices with sensors, in particular, are critical for collecting detailed health data. These sensors are constantly creating massive amounts of data, which is referred to as Big Data. Proposed a secure Industrial Internet of Things (IoT) architecture for health care applications to store and handle scalable sensor data (big data). Sensor medical devices are attached to the patient's body to collect clinical data. When the respiratory rate, heart rate, blood pressure, body temperature, or blood sugar levels rise over normal, the devices send a clinically significant alarm message to the doctor via a wireless network. To protect large data in Industry 4.0, the suggested system employs a key management security method [34].

III HYPOTHESIS AND RESEARCH MODEL

3.1 Research Model

Significant factors relating to the influence of smart wearable medical devices in users were developed. The proposed SWMDM model which assists the user in monitoring their health, the SWMDM model which consists of Techno Fear, Socioeconomic Characteristics, Self- potency and Gerontology concern as other parameters used to study usersbehaviour on wearable devices. Table 2 describes the definition of parameters which is used in the hypothesis for the analysis of adoption of proposed models in elder adults.

Table 2 Definition of Parameters

Parameters	Definition
Gerontology Concern	The state at which the person concerns that he/she is getting older.
Socioeconomic Characteristics	It describes the background, education and the current profession.
Self-Potency	It states the self-potential of a person to make an impression.
Techno Fear	The person's state of mind to adapt to the technology.
Technical Expertise	Advice from the technical expert on some technology.
Perceived Usefulness	State at which a person thinks that using a particular technology would increase his or her activities.
Behaviour Objective	The suitability of a particular smart device which has adverse behaviour.
Perceived ease of use	The limit at which a person would think that using the technology would free his or her efforts.

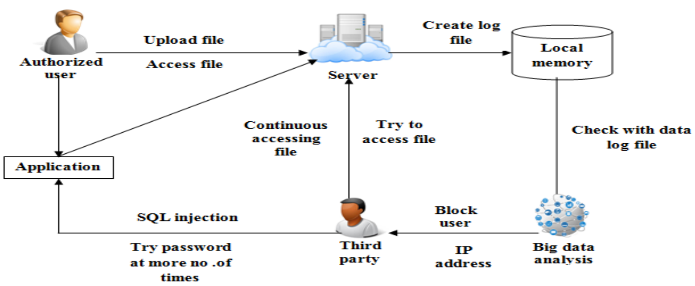


Fig. 2 SystemArchitecture

The figure 2 represents thesystemarchitecture, here the user can login with their details in the application and can upload the user data in the server by using the application. The server stored user data and created a log file in the local memory. The log file data is checked using big data analysis in the local memory. If the third party tries to access the user file in the server, the system would block the third party user by using big data analysis to avoid access of user data. With an investigation of the various prospects and connections between seemingly unconnected information, data mining may enable healthcare organisations to forecast trends in the patient's medical state and behaviour. Using conventional methodologies, health data mining opens up a world of options for evaluating a variety of less visible or secret data models. The most often used and significant methods in ARM for an Apriori algorithm are association rule mining (ARM). ARM is an excellent technique for discovering the relationship of data. It does, however, generate a vast number of rules and does not ensure the efficacy or worth of the knowledge produced [35].

3.2 Research Hypothesis

Information security and privacy are becoming more crucial challenges in the healthcare industry. The use of digital patient records based on legislation, provider consolidation, and the increased need to exchange information among patients and providers are all examples of improved information security. Big data in health care is expected to enhance patient outcomes, forecast epidemic outbreaks, provide significant insights, prevent diseases, lower health-care costs, and improve quality-of-life analysis [36]. However, a trustworthy big data environment is ensured by the big data analytics-based cybersecurity architecture for security and privacy across health-care apps. Furthermore, electronic health records (EHR) may be shared by multiple users in order to improve the quality of health-care services. This raises serious privacy concerns that must be resolved before the EHR can be used. This architecture, which includes numerous technical methods and environmental controls, has been proved to be sufficient for appropriately addressing typical network security risks. Gao et al. (2014) [26] suggested in earlier studies that the relationship between the perceived usefulness (PU) which has been affected by the perceived ease of use (PEOU). The initial model proposed by Davis in which he states that the perceived usefulness (PU) is affected by the perceived ease of use (PEOU). More realistic findings states that perceived usefulness is positively influenced by perceived ease of use. For instance, Van der Heijden et al. (2003) [27] came with the conclusion that, in environmental conditions the relationship between the perceived ease of use and perceived usefulness embraces true.

3 Proposed Smart Wearable Medical Device Model (SWMDM)

Figure 3 describes proposed Smart Wearable Medical Device Model (SWMDM) which has different parameters such as Socioeconomic Characteristics, Techno Fear, Technical Expertise, Gerontology Concern, Self-potency, and BehaviourObjective. These parameters are used to analyse how effective is the proposed model on the adaptation of smart wearable devices on elderly adults.

H1: The GC has a positive effect on elder users' PU towards SWMDM.

H2: The SWDB has a positive effect on elder users' approach towards SWMDM.

H3: The GC has a positive effect on elder users' approach towards SWMDM.

H4: The PU has a positive effect on elder users' BO towards SWMDM.

H5: The SP has a positive effect on elder users' BO towards SWMDM.

H6: The TF has a positive effect on elder users' approach towards use.

H7: The GC has a positive approach on elder users' behaviour towards SWMDM.

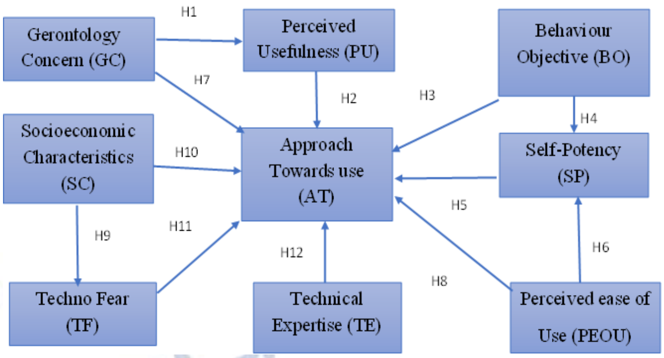
H8: The PEOU has a positive approach on elder users' approach towards SWMDM.

Socioeconomic Characteristics (SC)

Socioeconomic characteristics are an important factor influencing the elder adult and have been accepted in communities including academics. In [26], also states that the characteristics cover various aspects related to socio economic characters such as a person's age, gender, educational qualification, occupation and any factor which considers being an important part of one's behavioural aspects. For instance, the age of an adult will play a key factor in determining the acceptance of Smart wearable devices. The proposed work from the author in [28] found that age and gender influence the end judgment noticeably. Therefore, we have proposed the below hypothesis:

H9: Socioeconomic characteristics have positive effect on elder users' approach towards SWMDM

H10: Socioeconomic characteristics have a



positive effect on elder users' behaviour towards SWMDM.

Techno Fear (TF)

Techno fear states the factor at which an elder user using a technology for his or her life support gets some fear of using some technology. Smart wearable devices assist elderly people who are reliable on these technologies but that fact to consider before these devices assisting people is whether the elderly people who have been monitored their health through these devices have fear of using the technology or having no fear of using the technology. In order to explain the in-depth analysis of how it affects the model is proposed through a hypothesis.

H11: TF has a positive effect on elder users' approach towards SWMDM.

Technical Expertise (TE)

Assisting the elderly adults using a technology related devices will lead to a concern whether it is safe to use on the people. Technical expertise is the key factor influencing the act of knowing and analysing the technology to adults for monitoring their health. Here the expert will analyse the fact that the people who have been monitored are suitable for using the smart wearable devices in a stipulated time period. Based on the suggestion of the technical expert, the device is used on the elderly adult for assisting. We are proposing a hypothesis based on the technical expertise which is considered to be important in monitoring healthcare.

H12: TE has a positive effect on elder users' approach towards SWMDM.

3.3 An Observed Study

This study has been observed by our proposed research model through the use of SWMDM in India.

3.3.1 Development of Instruments

The analysed instrumental measures from earlier research were utilised as the background for this study. By reviewing the previous studies, we could include some of the key parameters. For the betterment of the observed study, small modification of the quaternaries was made. Our study related questions were obtained from earlier studies developed by authors in [29] and altered to fit the methodology of using smart wearable devices. English is used as a language to develop the questionnaires, 30 amounts of items were used in the questionnaires. In accumulation, a six point scale, with 1 giving negative of the scale (disagree strongly) and 6 giving positive of the scale (agree strongly), is used for participants' examination to get responses to the survey with questionnaires.

3.3.2 Samples

Data used in this study was gathered through sheet-based questionnaires from 10th Jan to 20th Jan 2020 in the urban areas in the largest city in south India. Voluntarily participation of the people was requested. The purpose and the main objective of the survey were explained to the people. The intention of the study is mainly to focus on the aged adults. The participants were told that their information in the questionnaires would be held as private and the results would be given as aggregate. Smart wearable device experience of the people is considered to be the key objective of the survey. 250 questionnaires were collected from the people, among which 220 of the questionnaires are considered for the evaluation as it was a valid. Participants among the survey included 120 were male and 100 were female. The participants in the survey are over the age of 60. Table 3 shows the statistical measures of each construct in the proposed model.

Table 3 Statistical Measures of Each Items in SWMDM model

Construct	Item	Factor Loading	Construct Reliability	AVE	Coefficient Alpha
Perceived Usefulness	PU1 PU2 PU3 PU4	0.758 0.786 0.792 0.800	0.798	0.700	0.948
Perceived ease of Use	PEOU 1 PEOU 2 PEOU 3 PEOU 4	0.745 0.795 0.822 0.854	0.898	0.694	0.966
Self-Potency	SP 1 SP 2 SP 3	0.765 0.875 0.800	0.878	0.802	0.806
Socioeconomic Characteristics	SC 1 SC 2 SC 3 SC 4	0.685 0.689 0.875 0.880	0.843	0.596	0.853
Techno Fear	TF 1 TF 2 TF 3	0.689 0.785 0.865	0.826	0.587	0.624
Technical Expertise	TE 1 TE 2	0.598 0.758	0.865	0.978	0.745
Gerontology Concern	GC 1 GC 2 GC 3	0.685 0.723 0.598	0.954	0.830	0.842
Behaviour Objective	BO 1 BO 2	0.756 0.799	0.903	0.887	0.851
Approach Towards Use	ATU 1 ATU 2	0.987 0.895	0.830	0.785	0.848

Table 4 Validity of Discriminant

Variables	GC	PU	BO	SC	AT	SP	TF	TE	PEOU
GC	0.9								
PU	0.6	0.8							
BO	0.7	0.6	0.7						
SC	-0.2	-0.1	-0.2	0.6					
AT	0.4	0.5	0.6	0.5	0.5				
SP	0.1	0	0.5	0.6	0.1	0.7			
TF	0.2	0.4	0.7	0.2	-0.1	0.3	0.8		
TE	0.5	0.4	0.4	0.4	0.2	0.6	-0.1	0.6	
PEOU	0.6	0.5	0.8	0.5	0.3	0.2	0.1	0.8	0.7

3.4 Hypothesis Model Measurement

The proposed hypothesis model quality is measured by validity of content, construct reliability and validity of discriminant which is mentioned by Bagozzi et al. (1979) [30]. To make sure that the validity of the content produced in the model, examination of the questionnaire with 5 researchers with expertise in the field of information system was gathered on Dec 2019. The questionnaire given in the model was found to be efficient and was correctly understood by all the researchers.

Moreover, for proving the validity and reliability of every model's construct, coefficient alpha is calculated which states the reliability of each and every construct. Coefficient alpha is the analysis of the inner consistency of the model, it's reflected to be a degree of reliability scale. In our model, the coefficient alpha value was in range from 0.624 to 0.966. Robinson et al. (1991) [31] stated that coefficient value of 0.6 is considered to be a tolerable limit for coefficient alpha for experimental research. All the value in our research model was above 0.61. Subsequently, the scales in the model were satisfactory to stay.

Assessment of validity of convergent is carried out through composite reliability and average variance extracted (AVE).Bagozzi and Yi (2012) [32] stated that the given criteria used for measurements such as factor loading for every item in the model should surpass 0.5, the composite reliability should surpass 0.7 and AVE of every construct should surpass 0.5. Table 1 shows that all values of the measurement items are in standard range. Validity of discriminant measurement is shown in Table 4 that is used for analysing the results of the model; the gathered variances by the constructs are greater than the aligned correlation among variables. Constructs models facts exposed were practically divergent. We attainedbetter results for validity of convergent and discriminant, test result of the models measurement was noble. Table 5 shows the Coefficient of Path based on Hypothesis.

3.4 Testing of Hypothesis and Structural Model

WarpPLS software is used to test the model and the results are shown in Table 6. Nine (H1, H3, H4, H5, H6, H8, H9, H11, H12) out of twelve research hypotheses wereconsiderably supported. Based on the results, Perceived Usefulness, Perceived ease of Use Behaviour Objective, Socioeconomic Characteristics, Technical Expertise were known to be statistically important effect on users' attitude towards SWMDM, whereas Gerontology Concern, Techno Fear, Self-Potency did not show important impact on users' behaviour of using SWMDM.

Table 5 Path's Coefficient based on Hypothesis

Source	Type III sum of squares	df	Mean square	F	sig	Partial eta-square
Model Corrected	24156.751	115	252.521	5.075	0.001	0.352
Interupt	21256.784	1	21256.784	3789.208	0.001	0.654
Total Devices	1245.875	5	421.562	7.652	0.001	0.0452
Body part	1278.547	3	298.512	5.854	0.089	0.045
Intervals in age	554.254	3	255.147	3.806	0.045	0.025
Intend in wearable devices	1615.532	5	842.025	13.712	0.002	0.058
Total Devices* body part	1785.586	14	175.256	3.652	0.003	0.069

Table 6 ANOVA of the acceptance of smart wearabledevices

Hypothesis	Path's Coefficient	Analysis of Hypothesis
H1: GC to PU	0.698	Supported
H2: SWDB to AT	-0.095	Not Supported
H3: GC to AT	0.289	Supported
H4: PU to BO	0.356	Supported
H5: SP to BO	0.456	Supported
H6: TF to AT	0.564	Supported
H7: GC to BO	-0.156	Not Supported
H8: PEOU to AT	0.542	Supported
H9: SC to AT	0.4	Supported
H10: SC to BT	0.052	Not Supported
H11: TF to AT	0.256	Supported
H12: TE to AT	0.343	Supported

IV RESULT AND DISCUSSION

The conclusion of the study made by the proposed SWMDM on the adoption of user wearable devices on the elderly adult were made through the Hypothesis and questionnaires were developed and the model was analysed based the questionnaires answered from elderly adults in the southern city of India. This study was evaluated according to the literature review from the previous models on the adoption of wearable devices on users. There were various factors influencing the adoption of smart wearable devices on the elder users, which includes factors such as socioeconomic characteristics, techno fear, technical expertise, gerontology concern. On the other hand,hypothesis was developed based on the factors considered for evaluation in smart wearable devices. Inference from the result indicates, found that 9 proposed hypotheses were supported. Self-potency (0.454), PEOU (0.542), Gerontology Concern (0.698) and Techno Fear (0.564) explains 54.5 percent of the perceived variance in users' attitude toward SWMDM. Substantially positive impact on users' attitude towards SWMDM is seen by having both PU and PEOU.

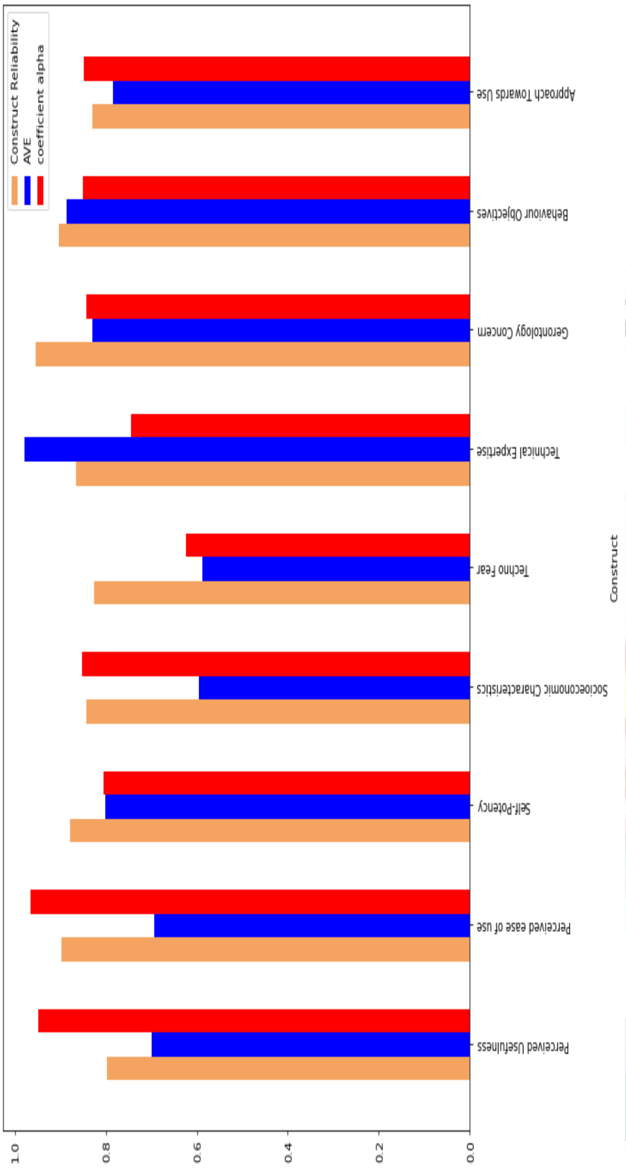


Fig. 4 Proposed SWMDM Models Statistical Analysis

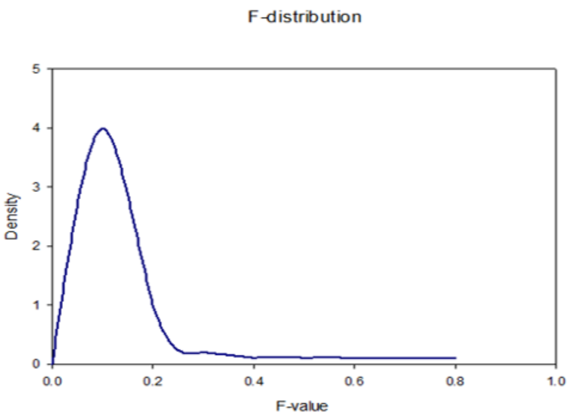


Fig. 5 Distribution based on Hypothesis

Statistical Measurements of every item in the SWMDM model is shown in figure 4. Every scales items internal consistency is measured using composite reliability, the construct variance amount is calculated using average variance extracted (AVE) and variance score of every construct observed is measured using Coefficient alpha. Average variance extracted is higher in Techno Fear, composite reliability is greater in Gerontology Concern and Technical Expertise shows higher rate of coefficient alpha. Figure 5 shows the F-distribution of the Anova test conducted on the proposed smart wearable device model, the F-value or score is calculated which determines the probability distribution function. F- Value is lower at higher density which states that the results obtained from the hypothesis are significant.

V CONCLUSION

The research proposed a smart wearable medical device model which is designed to assist the elderly adults. Hypothesis model was proposed with the help of questionnaires which is tested in the southern city of India. The results significantly state that 9 out of 12 hypotheses were supported. The model is analysed with the help of statistical measures of every item in the model and Analysis of variance is done on the hypothesis model developed. Results indicate that at higher density the F-value is low which means the proposed model yields significant results. Future scope of this research is to include additional influencing factors that influence the adoption of smart wearable medical devices in elderly adults and verifying the proposed research model in larger illustration of people across India.

REFERENCES

1. Milner, C., Van Norman, K., & Milner, J. (2012). The media's portrayal of ageing. *Global Population Ageing: Peril or Promise?*, 25.
2. Chen, K., & Chan, A. H. (2011). A review of technology acceptance by older adults. *Gerontechnology*.
3. Bourke, A. K., Prescher, S., Koehler, F., Cionca, V., Tavares, C., Gomis, S., ... & Nelson, J. (2012, August). Embedded fall and activity monitoring for a wearable ambient assisted living solution for older adults. In *2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (pp. 248-251). IEEE.
4. Chan, M., EstèVe, D., Fourniols, J. Y., Escriba, C., & Campo, E. (2012). Smart wearable systems: Current status

and future challenges. *Artificial intelligence in medicine*, *56*(3), 137-156.
5. Abdullah, A., Ismael, A., Rashid, A., Abou-ElNour, A., &Tarique, M. (2015). Real time wireless health monitoring application using mobile devices. *International Journal of Computer Networks & Communications (IJCNC)*, *7*(3), 13-30.
6. Joyce, K., &Loe, M. (2010). A sociological approach to ageing, technology and health. *Sociology of health & illness*, *32*(2), 171-180.
7. Li, H., Wu, J., Gao, Y., & Shi, Y. (2016). Examining individuals' adoption of healthcare wearable devices: An empirical study from privacy calculus perspective. *International journal of medical informatics*, *88*, 8-17.
8. Abbate, S., Avvenuti, M., Bonatesta, F., Cola, G., Corsini, P., & Vecchio, A. (2012). A smartphone-based fall detection system. *Pervasive and Mobile Computing*, *8*(6), 883-899.
9. Murugan, N. S., & Devi, G. U. (2018). Detecting streaming of Twitter spam using hybrid method. *Wireless Personal Communications*, *103*(2), 1353-1374.
10. Murugan, N. S., & Devi, G. U. (2019). Feature extraction using LR-PCA hybridization on twitter data and classification accuracy using machine learning algorithms. *Cluster Computing*, *22*(6), 13965-13974.
11. Lesnoff-Caravaglia, G. (2007). *Gerontechnology: Growing old in a technological society*. Charles C Thomas Publisher, Limited.
12. Pressler, K. A., & Ferraro, K. F. (2010). Assistive device use as a dynamic acquisition process in later life. *The Gerontologist*, *50*(3), 371-381.
13. Lin, C. A. (2003). An interactive communication technology adoption model. *Communication theory*, *13*(4), 345-365.
14. Melenhorst, A. S., Rogers, W. A., &Bouwhuis, D. G. (2006). Older adults' motivated choice for technological innovation: Evidence for benefit-driven selectivity. *Psychology and aging*, *21*(1), 190.
15. Pan, S., & Jordan-Marsh, M. (2010). Internet use intention and adoption among Chinese older adults: From the expanded technology acceptance model perspective. *Computers in human behavior*, *26*(5), 1111-1119.
16. Dogruel, L., Joeckel, S., & Bowman, N. D. (2015). The use and acceptance of new media entertainment technology by elderly users: Development of an expanded technology acceptance model. *Behaviour& Information Technology*, *34*(11), 1052-1063.
17. Chen, K., & Chan, A. H. S. (2014). Gerontechnology acceptance by elderly Hong Kong Chinese: a senior technology acceptance model (STAM). *Ergonomics*, *57*(5), 635-652.
18. Zhou, S., Ogihara, A., Nishimura, S., &Jin, Q. (2018, October). Correlation analysis of health and Traditional Chinese Medicine (TCM) pulse diagnosis for the elderly using wearable devices. In *2018 9th International Conference on Information Technology in Medicine and Education (ITME)* (pp. 745-749). IEEE.
19. Nelson, E. A., &Dannefer, D. (1992). Aged heterogeneity: Fact or fiction? The fate of diversity in gerontological research. *The Gerontologist*, *32*(1), 17-23.
20. Czaja, S. J., Boot, W. R., Charness, N., & Rogers, W. A. (2019). *Designing for older adults: Principles and creative human factors approaches*. CRC press.
21. Wu, H. C. (2011). Electronic paper display preferred viewing distance and character size for different age groups. *Ergonomics*, *54*(9), 806-814.
22. Lin, H., Hsu, Y. L., Hsu, M. S., & Cheng, C. M. (2013). Development and practice of a telehealthcare expert system (TES). *Telemedicine and e-Health*, *19*(7), 549-556.
23. Wagner, N., Hassanein, K., & Head, M. (2010). Computer use by older adults: A multi-disciplinary review. *Computers in human behavior*, *26*(5), 870-882.
24. Pan, S., & Jordan-Marsh, M. (2010). Internet use intention and adoption among Chinese older adults: From the expanded technology acceptance model perspective. *Computers in human behavior*, *26*(5), 1111-1119.
25. Werner, J. M., Carlson, M., Jordan-Marsh, M., & Clark, F. (2011). Predictors of computer use in community-dwelling, ethnically diverse older adults. *Human Factors*, *53*(5), 431-447.
26. Gao, S., Krogstie, J., &Siau, K. (2011). Developing an instrument to measure the adoption of mobile services. *Mobile information systems*, *7*(1), 45-67.
27. Van der Heijden, H. (2003). Factors influencing the usage of websites: the case of a generic portal in The Netherlands. *Information & management*, *40*(6), 541-549.
28. Featherman, M. S., &Pavlou, P. A. (2003). Predicting e-services adoption: a perceived risk facets perspective. *International journal of human-computer studies*, *59*(4), 451-474.
29. Venkatesh, V., Morris, M. G., & Ackerman, P. L. (2000). A longitudinal field investigation of gender differences in individual technology adoption decision-making processes. *Organizational behavior and human decision processes*, *83*(1), 33-60.
30. Bagozzi, R. P. (1979). The role of measurement in theory construction and hypothesis testing: toward a holistic model. *Conceptual and theoretical developments in marketing*, *15*, 32.
31. Robinson, J. P., Shaver, P. R., &Wrightsman, L. S. (1991). Criteria for scale selection and evaluation. *Measures of personality and social psychological attitudes*, *1*(3), 1-16.
32. Bagozzi, R. P., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal*

of the academy of marketing science, *40*(1), 8-34.

33. Thota, C., Sundarasekar, R., Manogaran, G., R, V., & K., P. M. (n.d.). Centralized Fog Computing Security Platform for IoT and Cloud in Healthcare System. Fog Computing, 365-378. doi:10.4018/978-1-5225-5649-7.ch018
34. Manogaran, G., Thota, C., Lopez, D., &Sundarasekar, R. (2017). Big Data Security Intelligence for Healthcare Industry 4.0. Springer Series in Advanced Manufacturing Cybersecurity for Industry 4.0, 103-126. doi:10.1007/978-3-319-50660-9_5
35. Sornalakshmi, M., Balamurali, S., Venkatesulu, M., Krishnan, M. N., Ramasamy, L. K., Kadry, S., . . . Muthu, B. A. (2020). Hybrid method for mining rules based on enhanced Apriori algorithm with sequential minimal optimization in healthcare industry. Neural Computing and Applications. doi:10.1007/s00521-020-04862-2
36. Zhu, Shanying, et al. "Achieving Data Security and Privacy across Healthcare Applications Using Cyber Security Mechanisms." The Electronic Library, vol. 38, no. 5/6, 2020, pp. 979–995., doi:10.1108/el-07-2020-0219.