Revolutionizing Healthcare: Forecasting the Market Size of Wearable Medical Devices in the Big Data-Driven New Health Economy

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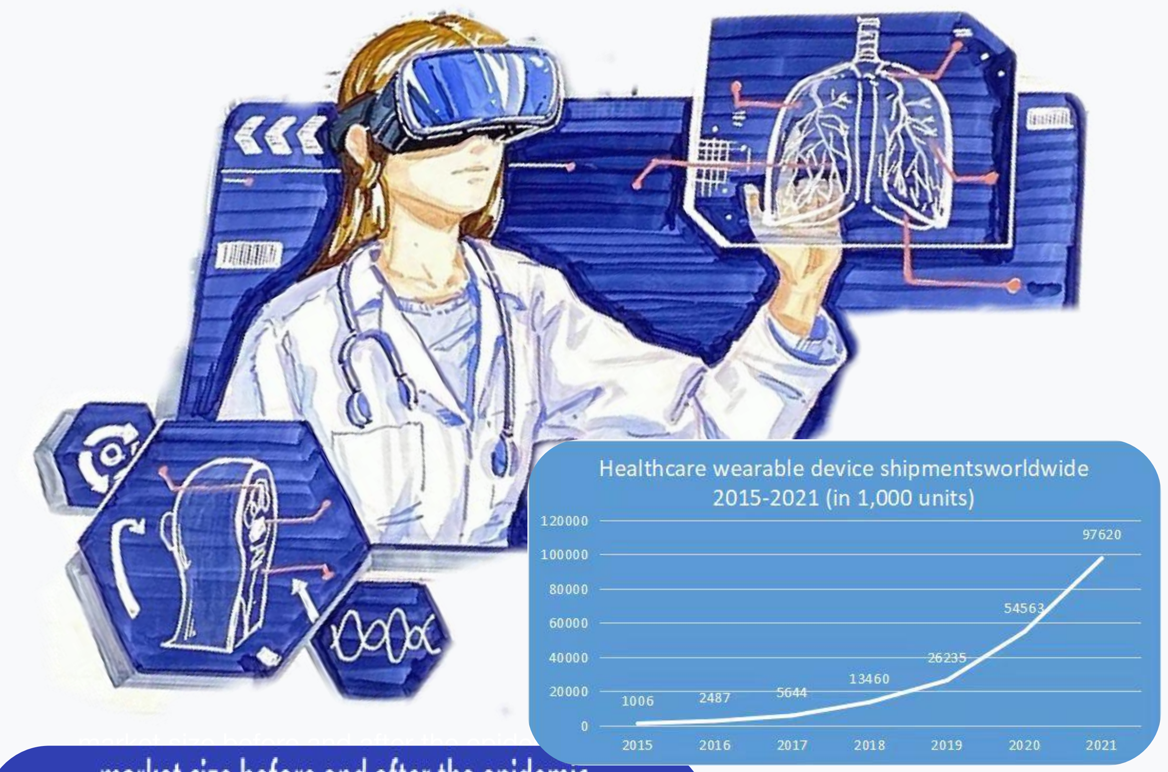
Abstract

This study investigates the influencing factors on the adoption of wearable medical devices in China using a modified **Technology Acceptance Model (TAM)**. A survey was conducted with **257** participants, and data analysis was performed, including reliability analysis, confirmatory factor analysis, and structural equation modeling. The results showed that factors such as perceived usefulness, perceived ease of use, and external factors significantly affected individuals' willingness to use WMDs. Gender, age, education, and previous WMD use also played a role in technology acceptance. These findings provide valuable insights for technology manufacturers and healthcare management in promoting the adoption of WMDs in China.



Background

Wearable medical devices are intelligent health monitoring tools worn on the body surface. They collect, analyze, and transmit real-time health data. There are various types available, like smartwatches and patches, serving different purposes. The Global wearable medical device market growing rapidly, 2015-2022 shipments **increased by 96%** with smartwatches most popular. China market expanded from 2016-2021, 2021 **grew by 17.21%**, 5-year growth of **430%**. China ranks third globally in wearable medical device adoption, 2021 shipments surpassed 100 million units. COVID-19 boosted demand, highlighting health' s importance in China' s lifestyle. In this condition, we aimed to explore influencing factors through big data for a prediction.

market size before and after the epidemic

	2019-2020[%]	2020-2021[%]	2025-2026 future prediction[billion dollar]
China	48.78	17.21	2.459
USA	59.21	34.51	23.1
Italy	10.76	13.23	0.10927
worldwide	107.99	98.91	72.55

Methodology

Instruments

TAM predicts technology acceptance.
Davis(1989) suggests that perceived usefulness and perceived ease of use significantly affect an individual' s attitude toward using technology, which subsequently influences their intention to use and actual usage behavior. Our questionnaire design was informed by the studies of Yan (2012) and Wang (2018) et al. Based on the extension of the original model by Venkatesh et al. in 2012, a modified TAM model was obtained.

Sample

We received 257 valid survey responses, doubled to 514. 48% **male**, 50% **female.**
Education: 47% bachelor' s, 13% master' s or higher.
Age: 35.4% 18-30, 24.5% 41-50, 24.5% 51-60.
75% **live alone,** 71% **no monitored illnesses.**
50% **experienced WMD use.**

Data Analysis

First, conduct a **reliability analysis** on the questionnaire. Conduct a **validity analysis** using confirmatory factor analysis (**CFA**).
Then, utilize structural equation modeling (**SEM**) to generate path diagrams.
Finally, conduct a **cross-analysis** between exogenous variables and factors.

Result

Preprocess

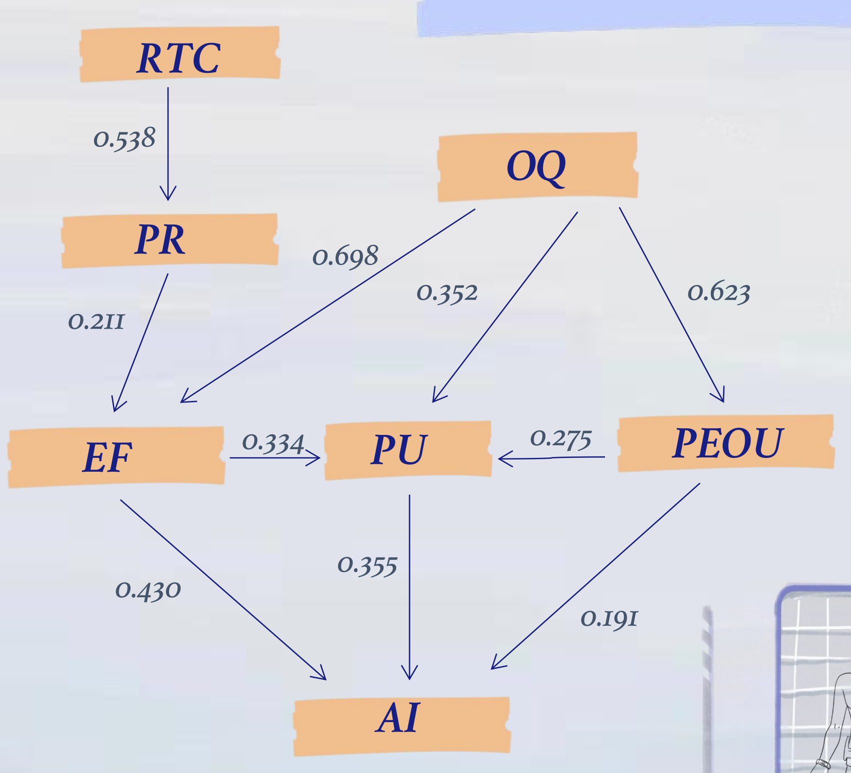
The questionnaire, based on TAM, consisted of **23 Likert scale items**, **2 attention check questions**, and 8 demographic items. It included 8 factors and 6 exogenous variables. After data cleaning, **257 valid responses** were obtained, which were **doubled to 517**. Reliability analysis using **Cronbach' s α** showed that all factors had values greater than 0.7, except for the DT factor. To ensure model quality, we decided to remove the DT factor. **Confirmatory factor analysis** (CFA) was performed, including **factor loadings**, **model AVE and CR indices, and fit measures**, to validate factor convergence, discriminant validity, and model fit.

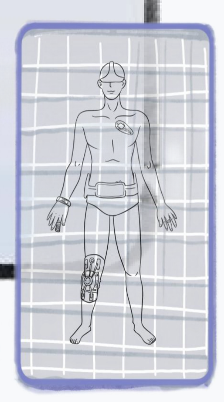
Factor	Full name
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
PR	Perceived Risk
EF	Environmental Factors
OQ	Perceived Outcome Quantity
RTC	Resist Change
AI	Affect Intention to Use

Factor (Latent variables)	→	*Analysis Item (Explicit Variable)*	*Normalization factor*	*Standard error*	*Z*	*P*
RTC	→	PR	0.538	0.057	9.935	0.000***
EF	→	AI	0.430	0.072	6.630	0.000***
PU	→	AI	0.355	0.074	4.584	0.000***
PEOU	→	AI	0.191	0.059	3.509	0.000***
PR	→	EF	0.211	0.033	4.693	0.000***
OQ	→	EF	0.698	0.062	11.261	0.000***
OQ	→	PU	0.352	0.095	4.308	0.000***
EF	→	PU	0.334	0.076	5.113	0.000***
PEOU	→	PU	0.275	0.063	4.925	0.000***
OQ	→	PEOU	0.623	0.062	10.272	0.000***

*Note: ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively.*

Path Diagram





Model Analysis

EF, PU, and PEOU all positively and significantly influence willingness to use.
PR and OQ directly positively and significantly affect EF, and RTC indirectly and positively affects EF through PR.
EF, OQ, and PEOU all positively and significantly influence PU.
OQ positively and significantly influences PEOU.

Cross-Tabulation Analysis

By conducting a cross-tabulation analysis of the results from the Likert scale and the exogenous variables, we obtained the following findings. Men focus more on WMD practicality, while women are more concerned with their willingness to use WMDs. In terms of technology acceptance, younger people prioritize their willingness to use, while older individuals value the safety and convenience of WMDs. Higher levels of education make it easier for individuals to grasp the usage of electronic devices. People with medical needs prioritize the usability of WMD devices. Those who have used WMDs are influenced by internal and external factors.

Implications for Management

-(WEI ,2018)

From the perspective of technology, technology manufacturers need to fully understand the usage habits of patients. From the perspective of patient experience, the operation should be simplified to improve PU and PEOU.

Conclusion

This study identified key factors influencing the adoption of wearable medical devices (WMDs) in China. The findings highlight the significance of perceived usefulness, ease of use, and external factors in individuals' acceptance of WMDs. Gender, age, education, and previous WMD use also play a role. These insights can inform technology manufacturers and healthcare management in promoting WMD adoption.

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