The Market Feasibility Analysis of AI-Based Extended Reality (XR) Mental Healthcare Service in Taiwan

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Abstract

This thesis investigates the demand for VR/AR-based mental health promotion among Taiwanese consumers, utilising the Technology Acceptance Model (TAM) and the Heckman model to analyse factors influencing willingness to use (WTU) and willingness to pay (WTP). The study adopts a two-phase approach: in the first phase, WTU is assessed among 257 respondents, focusing on variables such as mental health severity and open-mindedness, with open-mindedness identified as a significant influencer. In the second phase, the analysis narrowed to 193 participants who expressed a positive WTU, employing a two-stage Heckman analysis to examine their WTP.

Results indicate that consumers exhibit notable price sensitivity, particularly in per-use payments, suggesting that while there is genuine interest in VR/AR services, potential users are cautious about costs. Additionally, demographic trends reveal that younger respondents demonstrate a greater willingness to invest higher amounts in VR/AR mental health services. The findings show distinct influences on WTP across payment models, with users prioritising service frequency and duration over pricing considerations in subscription scenarios. This research provides valuable insights for healthcare practitioners, researchers, and industry stakeholders interested in the evolving landscape of XR-based therapies in Taiwan.

Keywords: VR/AR, digital market, pricing, binary logistic model (BLM), Heckman model, Taiwanese consumers, healthcare innovation.

1. Introduction

The application of virtual reality (VR) and augmented reality (AR) technologies in healthcare, collectively termed "XR" (extended reality), has emerged as a prominent area of research and development in recent years. The increasing accessibility of XR hardware, driven by a decline in prices and the launch of new devices such as Meta glasses and Apple Vision Pro, enhances the potential for widespread software usage. Existing literature highlights the potential benefits and challenges of implementing XR-based therapies for various medical disorders. Numerous studies have underscored the therapeutic applications of VR and AR across diverse domains, including pain management (Garrett et al., 2018; Malloy & Milling, 2010), psychological disorders (Valmaggia et al., 2016; Parsons & Rizzo, 2008), and neurorehabilitation (Laver et al., 2017; Maggio et al., 2019). These technologies offer immersive experiences that can complement traditional treatments, enhancing patient engagement and improving overall health outcomes.

In Taiwan, the mental health landscape faces significant challenges, primarily due to a shortage of mental health professionals. "*As of 2017, approximately 1.5 million individuals in Taiwan suffered from some form of depression. Additionally, the ratio of psychiatrists in Taiwan stands at about 7.25 per 100,000 people* " (Therapy Helpers, 2024), underscoring the urgent need for effective mental health services. This shortage, combined with the societal stigma surrounding mental health, has resulted in severe consequences, including rising suicide rates and substantial economic costs linked to untreated mental health conditions (Taiwan News, 2023).

Establishing community-based mental healthcare centres is needed in response to these urgent concerns. Moreover, the World Health Organization (2023) reports a dramatic rise in mental health issues, particularly in the aftermath of the COVID-19 pandemic. Additionally, the United States

represents the largest market for healthcare technologies, with a projected market growth rate for XR solutions predicting an ever-increasing demand for such services (Maximize Market Research, 2024; Grand View Research, 2024). However, they are currently facing operational challenges. A study examining insights from healthcare professionals revealed difficulties such as unclear objectives, inadequate service provision, and a lack of public awareness regarding mental health (Yao & Hong, 2023). These findings emphasise the necessity for improved policies and resources to bolster mental health support across Taiwan.

Despite advancements in XR applications, the literature specifically addressing the management of the XR healthcare industry remains limited. While industry reports and news articles have highlighted specialised VR/AR therapies, there is a notable absence of peer-reviewed academic research that focuses on the management aspects of the XR healthcare sector. Among the companies, XRHealth (ranked 16 globally) is a target for in-depth analysis (Maximize Market Research, 2024). XRHealth has obtained FDA-cleared VR technology to provide therapy and further invested in the business through its strategic merger with Amelia Virtual Care, expanding its operations from physical therapy to mental health, catering to diverse patient needs (chronic pain, anxiety, and depression). Noteworthy competitors in the metaverse mental healthcare industry include AppliedVR, Karuna Labs, and CognifiSense, which offer innovative mental health solutions tailored to diverse patient needs.

Notably, research by Golrezaei et al. (2020) on price competition under consumer reference effects provides insights into how consumer expectations shape market dynamics, which is relevant to understanding the pricing of XR services. Their study illustrates that reference prices significantly influence consumer demand, a concept that may explain the challenges Taiwanese consumers who lack prior exposure to XR products. Similarly, Ma (2024) discusses assortment optimisation,

emphasising the importance of understanding consumer choice and inventory management, crucial elements for offering XR solutions effectively.

Moreover, Fong et al. (2023) investigate the effectiveness of suggested pricing in e-commerce platforms, highlighting how platform-suggested prices can influence seller behaviour and consumer acceptance. This research is particularly relevant to the XR market, where pricing strategies could determine the adoption rates of XR mental health services.

Furthermore, a recent essay by Bergin et al. (2024) examines public attitudes towards VR psychotherapy in the UK, a developed market; however, it largely overlooks practical applications. In this context, the strategic use of pricing and capacity management for differentiated products, as discussed by Shin et al. (2010), provides a framework for understanding how firms can leverage shortages to enhance profitability in competitive environments. Additionally, research by Shin, Niculescu, and Whang (2012) on consumer heterogeneity in subscription-based IT services with network effects can shed light on how varying consumer preferences affect market dynamics.

A recent essay by ADG Bergin et al. (2024) discusses public attitudes towards VR psychotherapy in the UK, a developed market; however, it largely overlooks practical applications. This essay aims to explore the feasibility of introducing XR mental healthcare services, like XRHealth, in Taiwan. It will assess critical factors, including consumer willingness to use (WTU) and willingness to pay (WTP) for these services, utilising the Technology Acceptance Model (TAM) and the Heckman model. This approach will address consumer behaviour and decision-making processes while proposing a business model delineating market positioning and competitive advantages. The insights derived from this

research will be valuable to healthcare practitioners, researchers, and industry stakeholders interested in the evolving landscape of XR-based therapies.

2. Methods

2.1 Concept Framework and Hypothesis

This research proposal aims to investigate the demand among Taiwanese consumers for utilising VR/AR-based mental health promotion support. Grounded in the Technology Acceptance Model (TAM), the study employs a two-phase approach to explore the factors influencing both willingness to use (WTU) and willingness to pay (WTP) among users. Specifically, the research focuses on individuals who demonstrate a positive willingness to use (N=257) in the first phase, subsequently assessing their willingness to pay (N=193) in the second phase. Figure 1 and 2 illustrates the conceptual framework that elucidates the relationships among consumer characteristics, Perceived Ease of Use, Perceived Usefulness and adoption behaviours in VR and AR experiences.

- **Phase 1: Willing to Use (WTU) Analysis**

  In the first phase (Fig 1 and Table 1), a confirmatory factor analysis will be conducted to validate the measurement model using binary logistic regression. The analysis will focus on key factors, including mental health severity, open-mindedness, perceived ease of use, and perceived usefulness. This phase aims to establish a clear understanding of the variables that influence consumers' willingness to use VR/AR mental health services.

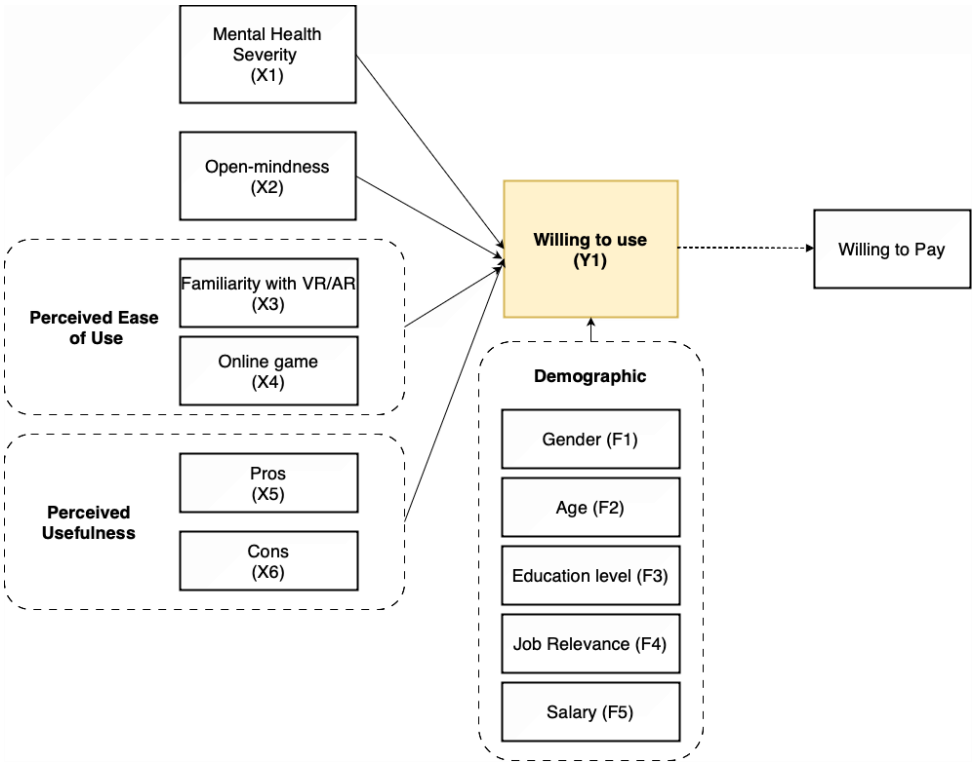

Fig 1. Holistic Technology Acceptance and Willingness to Pay (HTAWP) Framework: WTU (H1-H2: thesis (Open-mindedness), H3-H6: TAM add, Demographic (Control variable(VAR.)): population)

Table 1. Phase 1 Hypothesis

Hypothesis	
Willing to Use (Y1)	
H1-1	Higher Mental Illness Severity (X1) is more willing to use (Y1)
H1-2	More Open-mindedness (X2) are more willing to use (Y1) compared to those without such prior experience.
H1-3	Higher familiarity with VR/AR technology (X3) will increase willingness to use (Y1).
H1-4	Better online gaming experience (X4) will positively increase willingness to use (Y1).
H1-5	A greater perceived benefits (X5) will lead to a higher likelihood of individuals being willing to use (Y1).
H1-6	**Fewer** perceived disadvantages (X6) will like to use (Y1)

- **Phase 2: Willing to Pay (WTP) Analysis**

To analyse the willingness to pay (Fig 2 and Table 2), a two-stage Heckman selection model will be employed. In the first stage, a probit regression accounts for potential biases related to demographic variables (F), with the willingness to pay construct serving as the dependent variable. In the second stage, an ordinary least squares (OLS) regression will be used to model the amount the user is willing to pay, conditional on the decision to pay.

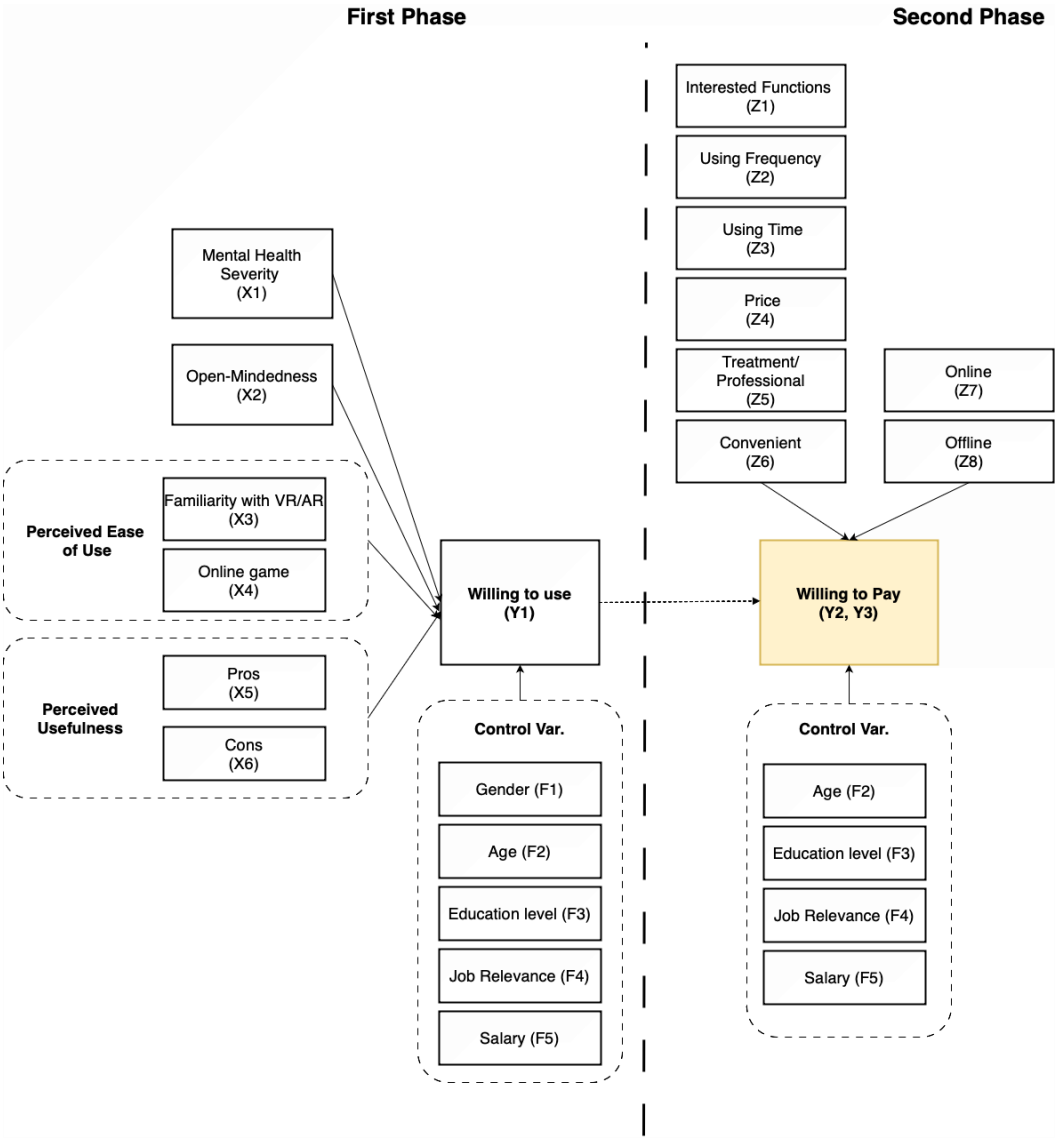

Fig 2. Holistic Technology Acceptance and Willingness to Pay (HTAWP) Framework: WTP

Table 2. Phase 2 Hypothesis

Hypothesis	
Willing to Pay (Y2): per time	
H2-1	More functions people think they are interested (Z1) higher willing to pay (Y2)
H2-2	Individuals who prefer to spend more time (Z3) on mental healthcare services will increase their willingness to pay per time (Y2)
H2-3	More sensitive to price (Z4) pay **less** (Y2)
H2-4	More care about treatment/ professional (Z5) pay more (Y2)
H2-5	More care about convenient (Z6) pay more (Y2)
H2-6	People prefer to use it online (Z7) while using (Y2)
H2-7	People think have more potential customers (Z8) if they want to use (Y2)
Willing to Pay (Y3): per month	
H3-1	More functions people think they are interested (Z1) higher willing to pay (Y3)
H3-2	More frequent people will spend time (Z2) on service higher willing pay (Y3)
H3-3	Individuals who prefer to spend more time (Z3) on mental healthcare services will increase their willingness to pay per month (Y3)
H3-4	More sensitive to price (Z4) pay **less** (Y3)
H3-5	More care about treatment/ professional (Z5) pay more (Y3)
H3-6	More care about convenient (Z6) pay more (Y3)
H3-7	People prefer to use it online (Z7) while using (Y3)
H3-8	People think have more potential customers (Z8) if they want to use (Y3)

2.2 Survey and Sampling Procedure

This research engaged an expert on Taiwanese consumer habits. We created an online questionnaire using Google Forms and received data through social media platforms, including Facebook, Instagram, and Line. This process yielded a total of 257 valid responses. The collected data underwent comprehensive statistical analysis. Before the official data collection, a pilot study was conducted in

May 2024, involving 13 samples to assess the clarity and relevance of the questionnaire items. Based on the feedback, the survey was revised, and the formal questionnaire was launched on social media in June 2024.

Descriptive statistics provide an overview of the respondents' demographics and survey responses. Advanced analytical techniques, including ANOVA, probit and regression analysis (TAM and Heckman model), were employed to extract insights into the Taiwanese public's perspectives and acceptance of mental health services. The study used RStudio (Version: 2024.09.1+394; posit), Excel and Python to offer data analysis. The findings from this research will inform the development of targeted interventions, enhancing our understanding of the Taiwanese public's views on and acceptance of mental health services.

2.3 Questionnaire and Measure

By gathering insights into the target market's mental health concerns, awareness of VR/AR applications, and interest in specific service offerings, this study will provide valuable information to guide the development, positioning, and marketing of VR/AR mental health promotion services in Taiwan. Additionally, this study uses a questionnaire, VR/AR Mental Health Promotion Service Demand Survey, to collect Taiwanese customers' perspectives so that we can know their predictions and desires. The questionnaire process is separated into four parts: Mental Health Status, VR/AR Experience, Product Imagination and Basic Information.

The measurement framework (Table 3) captures factors influencing consumer behaviour, including their willingness to use and share, payment preferences, and various psychological and demographic characteristics.

The variables have three distinct groups: dependent variables (Y), independent variables (X and Z) and demographic factors (F). Each variable quantifies specific aspects of consumer engagement and perception regarding VR/AR mental health solutions.

The dependent variables (Y) focus on consumer adoption behaviours, with metrics such as willingness to use (Y1) and willingness to pay for the services (Y2 and Y3). The independent variables (X and Z) explore consumer mental status and VR/AR experience. Additionally, independent variable Z assesses product imagination of user preferences, frequency of use, and buying influences that may affect their decision-making. Demographic characteristics (F) provide critical context, examining how gender, age, education, occupation, and income influence consumer attitudes.

We constructed a questionnaire to measure the variables mentioned above.

1) **Y**

- **Y1 (WTU, dummy variable):** We employed 5 degrees of the Likert scale to measure the willingness by Very unwilling (-2), Unwilling (-1), Average (0), Willing (1) and Very willing (2). Only when the user expresses Willing and Very willing Y1 is 1, and for the rest of the others, Y1 is 0.
- **Y2 (WTP (per time), price level):** We employed 5 price levels to measure the per-time payment range: < $500 (1), $501-1000 (2), $1001-1500 (3), $1501-2000 (4), > $2000 (5).
- **Y3 (WTP (month), scale variables):** We employed 5 price levels to measure the subscription payment range: < $500 (1), $501-1000 (2), $1001-1500 (3), $1501-2000 (4), > $2000 (5).

2) X

- **X1 (Mental Health Severity, multiple choices):** We identify 5 types of illness (Stress, Anxiety, Pressure, Fear, Emotional distress). X1 is a sum of the chosen type, with 0 for none, and others represent the user's mental status level.
- **X2 (Open-Mindedness, multiple choices):** We identify 8 methods (Talking to friends, Psychological counselling, Psychotherapy (medication), Unsure how to do, Changing lifestyle, Other therapies (e.g., Chinese medicine, meditation), Sports, Distract Attention) of solution for mental health. We measure X2 (Open-mindedness) as the sum of the chosen methods (0 for none) that the potential user has adopted.
- **X3 (Familiarity with VR/ AR, scale variables):** We employed 5 degrees of the Likert scale: Not at all familiar (-2), Unfamiliar (-1), Average (0), Familiar (1), Very familiar (2), to know whether user's comfort level and readiness for VR/AR.
- **X4 (Online game, scale variables):** We employed 5 degrees of the Likert scale: Strongly dislike (-2), Dislike (-1), Neutral (0), Like (1), Strongly like (2), to understand the respondent's general attitude and preference towards interactive digital experiences.
- **X5 (Pros, multiple choices):** We identify 8 advantages (Fun (even if it doesn't work), Diagnosis and treatment inside the game, Higher accuracy (AI), Lower cost, More convenience/efficiency, Personalised advice and treatment, No face-to-face required, 24/7 Available). X5 is a sum of the advantages, with 0 for none, and the key benefits and value propositions that consumers perceive in the VR/AR mental health promotion service.
- **X6 (Cons, multiple choices):** We identify 5 disadvantages (Uncommon, Less effective than traditional methods, Unreliable Technology, Lack of human interaction, Privacy issues). X6 is a sum of the disadvantages, with 0 for none, and the customers' concerns and perceived drawbacks of the VR/AR mental health promotion service.

3) **F**

- **F1 (Gender, dummy variable):** Gender of the respondents, where 0 represents male and 1 represents female.
- **F2 (Age, multiple choices):** The age range of the user: < 18 (1), 18-25 (2), 26-35 (3), 36-45 (4), 46-55 (5), 56-60 (6), > 60 (7), where 1 represents the youngest age group to 7 represents the oldest age group.
- **F3 (Education level):** Education level of the user: Middle school (1), High school (2), University (3), Graduate (4), where 1 represents the lowest level to 4 represents the highest level.
- **F4 (Occupation, dummy variables)**: We identify jobs with 0 and 1 and analyse the major part of the population, F41 (Student) : 0 (no) or 1 (yes); F42 (Employee): 0 (no) or 1 (yes).
- **F5 (Monthly Income Range, multiple choices):** We employed 5 income range to measure the purchasing power: < $20,000 (1), $20,000- 40,000 (2), $40,000- 60,000 (3), $60,000- 80,000 (4), $80,000- 100,000 (5).

4) **Z**

- **Z1 (Interested Functions, multiple choices):** The value is the sum of Z1 (Online mental health courses, Personalised mental health advice, Automatic mood tracking, Chatbot emotional support), with 0 representing no interest and 1 representing one of the interested parts. We measure Z1 as the sum of the chosen interest functions (0 for none) that specific content and features of interest to users.
- **Z2 (Using Frequency, multiple choices):** We define 5 different frequencies: When needed (0), Several times/ months (1), Several times/ weeks (2), Once a week (3), Daily (4), Recommended plan (5), to know user's maximum frequency willing to use.

- **Z3 (Using Time, multiple choices):** We define 5 maximum duration: Daily (5), < 10 mins (4), 11-20 mins (3), 21-30 mins (2), > 30 mins (1).
- **Z4 (Price, dummy variable):** User's buying consideration: Price sensitive. The value is 0 (no) or 1 (yes).
- **Z5 (Treatment/ Professional, dummy variable):** User's buying consideration: service's treatment and professional. The value is 0 (no) or 1 (yes).
- **Z6 (Convenient, dummy variable):** User's buying consideration: service convenient. The value is 0 (no) or 1 (yes).
- **Z7 (Online, dummy variable):** Indicates whether the user prefers using online (1) or not (0).
- **Z8 (Offline, dummy variable):** Indicates whether the user prefers using offline (1) or not (0).

Table 3. Measure of Variables

Variances	Value
Y	
Y1 Willing to use	0, 1
Y2 Willing to Pay (/ time)	1 ~ 5
Y3 Willing to Pay (/ month)	1~ 5
X	
X1 Mental Health Severity	the sum of types, 0, 1 (level)
X2 Open-Mindedness	the sum of methods, 0, 1 (diversity)
X3 Familiarity with VR/ AR	-2 ~ 2
X4 Online game	-2 ~ 2
X5 Pros	sum of n8, 0, 1
X6 Cons	sum of n5, 0, 1
F	
F1 Gender	0, 1 (m, f)
F2 Age	1 ~ 7

F3 Education level	1 ~ 4
F4 Occupation	
F41 Student	0,1
F42 Employee	0,1
F5 Monthly Income Range	1 ~ 6
Z	
Z1 Interested Functions	sum of n4, 0, 1
Z2 Using Frequency	0 ~ 5 (when they need = 0)
Z3 Using Time	1 ~ 5
Z4 Price	0, 1
Z5 Treatment/ Professional	0, 1
Z6 Convenient	0, 1
Z7 Online	0, 1
Z8 Offline	0, 1

3. Results

Our study collected data from 257 respondents through an online questionnaire via Google Forms. While 193 participants expressed interest in VR/AR healthcare services, the remaining 64 indicated no interest. Initially, the analysis will encompass both interest and uninterest groups (N=257), followed by a focused examination of the interest group (N=193) to assess their willingness to utilise the service based on the questionnaire responses. In our analysis, demographic factors (F) will be treated as control variables, while the remaining variables (X, Z: mental status, VR/AR experience, or product imagination) will serve as explanatory variables. The dependent variable, Y (adoption: willingness to use or pay for VR/AR mental healthcare services), is categorical.

The following description has two sections: Willingness to Use (Y1) and Willingness to Pay (Y3, Y4).

2.3 Willingness to Use (Y1)

Upon analysing Willingness to Use (Y1) with Mental Status, VR/AR Experience, and Product Imagination (X) and demographics (F), the model demonstrates a robust result (Y1: $R^2 = 0.196$, $p < 0.001$) as shown in Table 2.

The analysis of Willingness to Use (Y1) reveals that VR/AR Experience (X3: Familiarity with VR/AR) and Product Imagination (X5: Pros) significantly influence users' willingness to adopt the service ($p < 0.01$). In addition, Open-mindedness (X2) further enhances the eagerness to utilise VR/AR mental healthcare services ($p < 0.05$). Lastly, it is noteworthy that the dependent variable (Y1) does not show a strong relationship with demographic variables (F).

Table 4. Binary Logistic Regression: First Phase (Y1, N=257)

Logistic Regression **(First Phase)**			Y1			
			Coef.	SE	z	P > z
Constant			-1.656	1.418	-1.168	.243
Explaining Variable	Mental Status	X1 Mental Health Severity	.065	.143	.456	.648
		X2 Open-mindedness	.418	.207	2.015	.044**
	VR/AR Experience	X3 Familiarity with VR/ AR	.710	.196	3.626	.000***
		X4 Online game	.173	.194	.892	.372
	Product Imagination	X5 Pros	.395	.132	2.986	.003***
		X6 Cons	-.044	.233	-.190	.849

Control Variable	Demographics	F1 Gender	.172	.361	.477	.633
		F2 Age	-.001	.151	-.004	.997
		F3 Education level	.179	.301	.595	.552
		F41 Student	.714	.533	1.341	.180
		F5 Monthly Income Range	-.010	.166	-.059	.953
N= 257			*McFadden's R^2 = .196*			*p(>Chi) < .001*
			Likelihood Ratio Test: $\chi^2(11) = 56.56$			*AIC = 255.93*

*Note: *p < 0.1; **p < 0.05; ***p < 0.01.*

Fig 3 exhibits a highly skewed distribution, with a prominent peak around the 0.95 probability level. This suggests that the logistic regression model can accurately identify a substantial proportion of users having a high probability of being willing to use the technology.

The distribution does not display a bimodal pattern, as there is no discernible peak or concentration of probabilities around any other probability level. Instead, the plot shows a steep decline in frequency as the predicted probabilities move away from the 0.95 peak, indicating that the model is less effective in predicting users with lower probabilities of Willingness to Use (Y1).

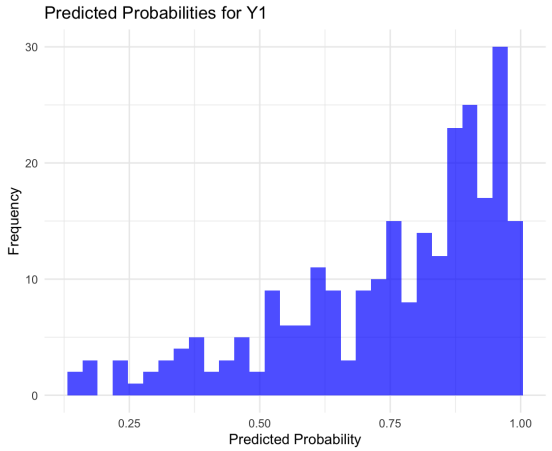

Fig 3. Predicted Probabilities for Y1: Logistic Regression (Y1, N=257)

2.4 Willingness to Pay

In this section, we examined the Willingness to Pay (WTP, Y2 and Y3) for Product Imagination (Z), as detailed in Table 3. The two-step Heckman analysis revealed marginally significant results for the outcome variable (Y2: $R^2 = 0.074$; $p < 0.01$; IMR < 0.05; Y3: $R^2 = 0.064$; $p < 0.01$; IMR > 0.1). In contrast, the analysis of per-use payment (IMR < 0.05) indicated a stronger influence of demographic factors compared to the subscription-based model (IMR > 0.1). This discrepancy may be attributed to the limited familiarity with VR/AR mental healthcare services among Taiwanese consumers, leading to uncertainty regarding appropriate pricing models for the service.

In the context of per-use payment, the result suggests that customers willing to pay are sensitive to pricing (Z4). This indicates that those inclined to use the service display a genuine interest but are cautious about cost considerations. Additionally, the analysis revealed that only age significantly affected WTP among all control variables. Specifically, younger respondents (F2) demonstrated a greater willingness to pay higher amounts for VR/AR mental health services on a per-use basis, highlighting a demographic trend favouring investment in innovative healthcare solutions.

While the selection process did not significantly influence subscription payments (Y3), it was observed that those who engage more frequently (Z2) and spend more time (Z3) on the service are willing to allocate a larger budget for subscriptions. Similarly, younger respondents (F2) are more inclined to pay higher amounts for these services.

In sum, the factors influencing respondents' WTP differ between the two payment models. Consumers exhibit greater price sensitivity when opting for per-use payments; however, those considering subscription models may prioritise frequency (Z2) and duration (Z3) of service usage over price.

Furthermore, the choice between online (Z7) and offline (Z8) service delivery does not significantly influence individuals' decisions to pay for mental health services.

Table 5. Heckman Model: Second Phase (Y2, Y3, N=193)

Heckman **(Second Phase)**			Y2				Y3			
			B	SE	t	p	B	SE	t	p
Constant (Outcome)			1.709	.248	6.894	.000***	1.835	.389	4.718	.000***
Explaining Variable	Product Imagination: Preference	Z1 Interested Functions	-.030	.042	-.723	.471	-.016	.063	-.248	.805
		Z2 Using Frequency					.131	.070	1.872	.063*
		Z3 Using Time	.058	.041	1.414	.159	.135	.064	2.101	.037**
		Z4 Price	-.271	.121	-2.241	.026**	-.162	.182	-.885	.377
		Z5 Treatment/ Professional	-.065	.106	-.614	.540	-.098	.163	-.604	.547
		Z6 Convenient	.116	.100	1.161	.247	.202	.154	1.305	.194
		Z7 Online	.127	.162	.781	.436	-.344	.261	-1.317	.190
		Z8 Offline	.080	.113	.704	.483	.027	.177	.155	.877
Constant (Selection)			1.965	1.481	1.327	.186	1.965	1.481	1.327	.186
Control Variable	Demographics	F2 Age	-.334	.172	-1.939	.054*	-.334	.172	-1.939	.054*
		F3 Education level	-.071	.370	-.193	.847	-.071	.370	-.193	.847
		F42 Employee	-.109	.688	-.158	.874	-.109	.688	-.158	.874
		F5 Monthly Income Range	.778	.518	1.501	.135	.778	.518	1.501	.135
N=193 (5 censored and 188 observed)			*IMR p < .05, R^2 = .074 df =178*				*IMR p > .1, R^2 = .064 df =177*			

*Note: *p < 0.1; **p < 0.05; ***p < 0.01.*

The analysis of consumers' Willingness to Pay (WTP) for the VR/AR mental healthcare service employed a two-step Heckman model as well as a visual representation of the WTP demand. While the Heckman model results demonstrated only marginal statistical significance, the WTP demand (Figure 4) aligns with the fundamental principles of demand theory, exhibiting a clear downward-sloping relationship between price and quantity demanded. This finding suggests that the underlying economic behaviour of consumers is well-captured by the demand function despite the complexity of the factors influencing WTP.

The figure depicts the demand curve for two payment options - per-use (Y2) and subscription-based (Y3) - across different quantities of respondents. As the quantity of respondents increases, the WTP for both payment models exhibits a downward trend, aligning with the law of demand.

For the per-use payment model (Y2), the demand curve demonstrates a steeper slope, indicating that respondents are more price-sensitive when considering individual usage of the services. The price level starts at around 3 (between $1,001 and $1,500) for a small number of respondents and decreases to approximately 88 for a larger quantity, suggesting a significant decline in WTP as the potential customer base expands. In contrast, the subscription-based model (Y3) exhibits a less steep demand curve, suggesting that respondents are relatively more willing to pay higher prices for a recurring payment plan. The price level ranges from around 5 (over $2,000) for a smaller number of respondents to around 80 for a larger quantity, indicating a more gradual decline in WTP as the potential customer base grows.

The differences in demand characteristics between the two payment models underscore the importance of understanding consumer preferences and price sensitivity when designing the pricing strategy for

VR/AR mental health services. The Heckman model results, which identified factors influencing WTP for each payment option, provide further context to interpret the demand patterns.

In conclusion, Figure 4 shows the market's WTP for VR/AR mental health services, complementing the statistical analysis and informing the development of an effective pricing strategy that aligns with consumer preferences in the Taiwanese market.

(Price Level: 1: below 500 dollars; 2: 501- 1000 dollars; 3: 1001-1500 dollars; 4: 1501-2000 dollars; 5: > 2000 dollars)

Fig 4. WTP demand (Y2, Y3)

4. Discussion

The findings of this study provide meaningful insights into the feasibility of introducing VR/AR-based mental healthcare services in Taiwan. Specifically, this research highlights the factors influencing consumer Willingness to Use (WTU) and Willingness to Pay (WTP), offering practical and theoretical implications for the adoption of XR technologies in mental health.

4.1 Practical Implications

The results emphasise the importance of familiarity with VR/AR technology (X3) and perceived benefits (X5) as key drivers of WTU. This result suggests that increasing public awareness and education about these technologies is essential in promoting adoption before it is introduced to the cautious market. For instance, informational campaigns, product demonstrations, and free trials can help potential users overcome initial reservations and recognise the value of VR/AR mental healthcare services.

Notably, the study points to price sensitivity (Z4) as a significant factor for per-use payment (Y2) models. This indicates that cost-effective pricing strategies, such as introductory discounts or freemium models, may be necessary to attract initial users. On the other hand, subscription-based payment models appear to appeal to users who prioritise frequent and continuous access to mental health services. Companies entering this market should carefully segment their target audience and design flexible pricing plans that cater to both occasional users and regular subscribers.

From a demographic perspective, younger (F2) individuals demonstrate a greater openness to innovation and a higher willingness to invest in VR/AR mental healthcare services. This finding suggests that marketing efforts should initially focus on younger populations, who may act as early adopters and drive broader acceptance of these technologies.

4.2 Theoretical Implications

This study extends the application of the Technology Acceptance Model (TAM) to the context of VR/AR mental healthcare services, providing evidence that perceived ease of use and perceived usefulness are critical factors influencing consumer adoption. The significant role of open-mindedness

and familiarity with VR/AR further supports the idea that psychological and experiential factors are essential in shaping consumer behaviour toward innovative technologies.

The Heckman selection model also offers an approach to understanding consumer willingness to pay, addressing potential biases in sample selection and providing a more nuanced analysis of payment preferences. The findings suggest that practical considerations (e.g., price sensitivity) and behavioural factors (e.g., frequency and duration of use) can influence consumers' WTP. This highlights the importance of considering consumer heterogeneity when designing pricing strategies for VR/AR services.

4.3 Policy Implications

The results have significant implications for policymakers aiming to address Taiwan's mental health challenges. The shortage of mental health professionals and the stigma associated with seeking treatment underscore the urgent need for innovative solutions such as VR/AR mental healthcare services. Policymakers should:

- **Increase Public Awareness**: Launch educational campaigns to reduce stigma and build familiarity with VR/AR technologies, particularly in underserved communities.
- **Provide Financial Support**: Subsidise the cost of VR/AR mental health services to make them accessible to low-income populations, thereby addressing affordability concerns.
- **Develop Regulatory Standards**: Establish clear guidelines for the implementation of VR/AR mental healthcare services to ensure safety, quality, and ethical use.

By addressing these policy areas, VR/AR technology adoption can introduce and involve a supportive environment in Taiwan, improving access to mental health services and enhancing patient outcomes.

5. Conclusion

This study sought to assess the feasibility of introducing VR/AR-based mental healthcare services in Taiwan by examining consumer Willingness to Use (WTU) and Willingness to Pay (WTP). The findings reveal that familiarity with VR/AR technology, perceived benefits, and open-mindedness are key factors influencing WTU, while price sensitivity and frequency of use significantly affect WTP. Younger consumers demonstrate higher adoption potential, making them a primary target for initial marketing efforts.

These results confirm the potential for VR/AR technologies to address Taiwan's mental health challenges by offering accessible, innovative solutions. However, success will depend on effective pricing strategies, public education, and supportive policies to overcome barriers to adoption.

5.1 Limitations

While this study provides valuable insights, several limitations should be acknowledged:

1. **Sample Representativeness**: The data collection relied on online platforms, which may introduce sampling bias and limit the generalizability of the findings. Future studies should aim to include more diverse and representative samples.
2. **Limited Familiarity with VR/AR**: As VR/AR technologies are relatively new in Taiwan, respondents may lack sufficient knowledge or experience to provide fully informed responses. Longitudinal studies could track how familiarity and adoption evolve.
3. **Simplified WTP Models**: The Heckman model used in this study captures key factors influencing WTP but may not account for all relevant variables, such as social influences,

perceived risks, or competitive pricing. Additional research is needed to refine these models and explore other factors.

5.2 Further Research

Building on the findings of this study, future research should:

1. **Expand the Scope**: Comparative studies across different countries or regions could provide a broader understanding of how cultural, economic, and healthcare contexts influence the adoption of VR/AR mental health services.
2. **Explore Consumer Behaviour**: Investigate additional factors influencing consumer decisions, such as social influence, perceived risks, and trust in technology. These factors could provide deeper insights into adoption barriers and enablers.
3. **Evaluate Real-World Applications**: Conduct pilot programs or field experiments to assess the effectiveness of VR/AR mental healthcare services in real-world settings. This would provide valuable data on user satisfaction, clinical outcomes, and cost-effectiveness.
4. **Investigate Long-Term Adoption**: Examine how consumer behaviour changes over time with increased exposure to VR/AR technologies. Longitudinal studies could identify trends and patterns that inform marketing and policy strategies.

In conclusion, this study provides a foundation for understanding the adoption of VR/AR mental healthcare services in Taiwan and offers actionable recommendations for businesses and policymakers. By addressing the identified challenges and leveraging the proposed strategies, stakeholders can unlock the potential of XR technologies to transform Taiwan's mental health landscape.

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