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Acceptance and Use of Sensor Technology in Diagnosis of Gender Dysphoria

Chun-Ming Shih,[1] Jiin-chyuan Mark Lai,[2] Yung-Kuan Chan,[3*]
Ming Yuan Hsieh,[4**] and Teen-Hang Meen[5]

[1]Graduate School of Human Sexuality, Shu-Te University,
No. 59, Hengshan Rd, Yanchao District, Kaohsiung City 824, Taiwan
[2]Department of Applied Foreign Languages, TransWorld University,
1221 Zhenan Road, Douliu City, Yunlin County 640, Taiwan
[3]Department of Management Information Systems, National Chung Hsing University,
145 Xingda Road, West District, Taichung City 40227, Taiwan
[4]Department of International Business, National Taichung University of Education,
140 Minsheng Road, South District, Taichung City 40306, Taiwan
[4]Graduate School of Human Sexuality, Shu-Te University,
No. 59, Hengshan Rd, Yanchao District, Taichung City 40306, Taiwan
[5]Department of Electronic Engineering, National Formosa University,
64 Wunhua Road, Huwei Township, Yunlin County 632, Taiwan

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The degree of acceptance and the impact of sensor technology on diagnosing gender dysphoria (GD) were investigated, cross-employing the technology acceptance model (TAM), follower theory (FT), and social identity theory (SIT). Through interviews with 20 invited experts and a questionnaire survey of 243 participants, alternatives (attitude toward using technology, behavioral intention to use, and actual system use), factors (innovative sensor technology, user's perception of the technology, and social identity), and subfactors (innovative sensor technology, behaviors within user's perception of the technology, and social identity) were defined. The analysis results showed that innovative sensor technology is important in the users' perception of the technology for the diagnosis of GD based on gender characteristics. The participant expected the actual use of the technology for the precise and reliable identification of GD. This result implies that sensor technology helps solve social problems caused by GD, and its applications can be evaluated in diversified behaviors in accordance with GD. Sensors that measure psychological disturbance were considered important for psychological and physical assessments. The results of this research reveal that more opportunities are required for the use of sensor technology as an efficient method for interdisciplinary research.

1. Introduction

With increasing awareness of gender issues, gender identification based on first impressions, such as those about a person's hairstyle and clothing, is generally no longer accepted as more

*Corresponding author: e-mail: ykchan@nchu.edu.tw
**Corresponding author: e-mail: uscpawisely@hotmail.com
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comprehensive criteria are required with the sexuality consideration of the lesbian, gay, bisexual, and transgender (LGBT).(1–3) Recently, mental gender characteristics have been used more than biological characteristics for gender identification. However, many people still often tend to expect, require, or judge gender on the basis of stereotypes acquired through traditional sex education and cultural heritage.(4–7) Disparate behavior from those of such stereotypes may cause a serious problem in society. Gender dysphoria (GD) is diagnosed when a person cannot identify his/her gender characteristics and must endure conflicting body characteristics.(8) For the complete psychological and physical diagnoses of a person with GD, sensor technology can be used to detect, monitor, and evaluate the body responses by telemedicine, as psychological and physical responses can be detected and the sensor data can be sent remotely. Thus, the use of sensor technology can lessen the shame and embarrassment of those who may be diagnosed with GD.

Sensor technology has been applied in diverse research areas that require human body responses, such as temperature, heat, pressure, speed, motion, and vibration direction, that can be detected by sensors. Diverse sensor technology has been developed for digital healthcare, especially for wearable devices and equipment. The sensor data include vital signs, temperature, blood pressure, heart rate, blood oxygen level, pupillary reflex, facial expression, muscle myokymia, and nerve beating.(8–11) The data can also be used in the professional counseling of GD by determining the state of patients, that is, whether they are comfortable, relaxed, or nervous.(12)

However, the degree of acceptance for sensor technology by physicians, counselors, and patients must be assessed, as traditional GD diagnosis only depends on qualitative measures including behavioral evaluation and diagnostic and statistical manuals of mental disorders (DSM-5). Therefore, this study was carried out to analyze and evaluate the willingness toward the use of sensor technology and data to diagnose GD by multivariate analysis and triangular hierarchical entropy (THE). In this study, the technology acceptance model (TAM), follower theory (FT), and social identity theory (SIT) were used to elucidate how the virtual platform of diagnosis and assessment of GD could be accepted and used.(13) The SIT was used to evaluate the relationship between individuals' attitudes, actions, behaviors, and society's response. The FT(14) of perception theory and the TAM(10) of technological behavioral theory were used to assay the perceived volitional and behavioral control of the perceived expressions and responses to the use of technology in GD diagnosis.(15–19)

2. Methods

2.1 Research theories and model

In analyzing the perceived volitional and behavioral expressions and responses, the TAM was discussed for use in sensor technology. The TAM is used to estimate and predict the impact of the sensor technology (ST) on human behaviors on the basis of the theory of reasoned action.(20) The TAM states interplays and dependences between technological information on user intentions and purposes, and its effects on users' beliefs, attitudes, and intentions. The perceived ease of use (PEOU) and perceived usefulness (PU) are two critical factors that affect the attitude toward using (ATU) and indirectly affect the behavioral intention to use (BIU). The ATU and BIU affect the actual system use (ASU) through external variables (EVs) in the TAM,(21) as shown in Fig. 1.

The PEOU is related to user confidence established by self-efficiency and self-control, and is increased by the increased use of specific technology. The PU represents the user's expectation of improved performance and better outcomes with the use of technology. Thus, the PU is positively affected by the PEOU and EVs. That is, the enhancement of the PEOU leads to the increase in the PU. The ATU is directly affected by the PEOU and PU, but the BIU is affected by the ATU through the use of specific technology. Ultimately, the EVs affect the PEOU and PU, as they are related to support from a technology provider, the operational platform, convenience of use in the user's situation, and the self-efficiency, self-control, and perception of the use of technology in accordance with the user's characteristics.

The following are the three important characteristics of the TAM:(22)

(1) The ATU, BIU, and ASU can be predicted.
(2) The PEOU is the major determining factor of the ATU.
(3) The PU is a subfactor of the ATU.

Empirically, the TAM is applied to assess the effect of new technology and predict the user's intentions, attitudes, and behaviors after using the technology.

To discuss the effect of the user's perception on the use of sensor technology, the FT is used to explain and analyze the user's immersion in using the technology. The user's understanding and skills with the technology are two major factors that control the user's immersion.(23,24) Self-assurance and learning behaviors affect the user's immersion. The rapid development of technologies is in response to technological effects on individual behavioral characteristics. Satisfaction with new technology depends on how users concentrate on technology and how comfortable they are with human–technology interaction.(25) The user's immersion is usually determined by the amount of attention paid to human–technology interaction.(26)

The SIT is applied to estimate the in-group favoritism and out-of-group discrimination as well as the intergroup conflict when accepting technology.(27) The SIT demonstrates cognitive processes by which people define their belongingness, memberships, and motivational processes of obtaining social identity in their groups. Social identity is defined as the individual's acceptance of the group's emotions and denotations. The following are the five principles in SIT.(28,29)

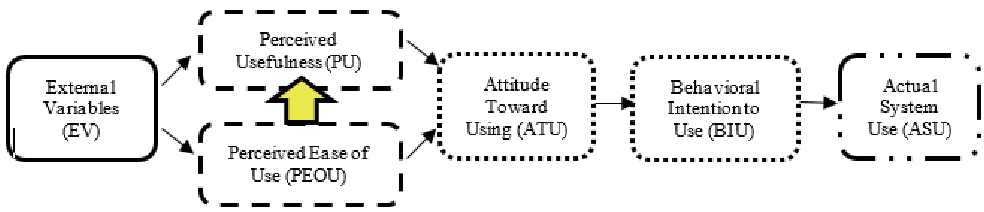

Fig. 1. (Color online) Factors affecting TAM.

(1) Social approval: The entire society positively responds to, recognizes, and supports individuals' attitudes, actions, and behaviors.
(2) Social reinforcement: The majority of group members desire to be identified by learning social skills to handle behavioral norms regarding public acceptance and approval.
(3) Social exchange: Social identity follows the interactions between the individual and society determined by the behavioral results. The interactions continue if the behavioral results are positive; otherwise, they stop.
(4) Social categorization: Individuals are classified by personality and characteristics in the group, and are then defined by their social categorization.
(5) Social comparison: Individuals compare their group with other groups in terms of their group's prestige and social standing to obtain higher self-esteem.

2.2 Questionnaire survey

Following the academic ethics regulation and policy of the Taiwanese Ministry of Science and Technology, we selected 250 participants for the questionnaire survey. The participants were students of higher educational institutions and were older than 18 years. Twenty experts were invited for in-person interview including five scholars with more than ten years of research experience in sensor technology, five specialists with more than ten years of working experience in GD counseling, five professionals with more than five years of working experience in interdisciplinary applications of sensor technology in industry, and five specialists with more than ten years of working experience in GD counseling and assessment. As found in previous studies, the number of experts for the interview must be around 10% of the total number of participants in the questionnaire survey in the Delphi method or similar hierarchical processes;(30–32) thus, we recruited 20 experts in total.

From 250 respondents, the number of valid responses collected was 243 with a return rate of 97.2%. The descriptive statistics of the questionnaire survey responses are presented in Table 1. 167 males (66.8%) and 76 females (33.2%) were included in the respondents, and 39.91% of the respondents were from the middle region, while 34.15, 16.87, and 9.07% were from the northern, southern, and eastern regions of Taiwan, respectively. 95.04% of the respondents had experience with sensor devices and 55.54% had used more than five sensor devices. 62.9% had heard about GD, but only 5.35% were counseled for problems related to gender, and 12.76% were receptive to counseling for such problems.

2.3 Statistical methods

To measure the dependences among the evaluated attitudes, namely, criteria and subcriteria among the TAM, FT, and SIT, multivariate data analysis (MDA) was employed to analyze the large-scale and expert-weighted questionnaire responses. First, factor analysis (FA)(33) was used to analyze and explore the relationships, patterns, and interactions among variables in a dataset. This approach is useful in studying complex systems with multiple factors affecting the outcome. In FA, dependent variables (directly observed impact-measured factors) are defined as Y (y_1,

Table 1
Descriptive statistics of the questionnaire survey responses.

Gender	167 males (66.8 %) and 76 females (33.2%)	
Number of respondents by region	83 (34.15%) from the northern region 97 (39.91%) from the middle region 41 (16.87%) from the southern region 22 (9.07%) from the eastern region	
How many times have you used sensor technological devices in the past?	None	12 (4.96%)
	One to five	96 (39.5%)
	Five to ten	83 (34.15%)
	Eleven to fifteen	36 (14.81%)
	More than sixteen	16 (6.58%)
Have you heard of GD before?	Yes	153 (62.9%)
	No	90 (37.1%)
Have you ever received counseling for problems related to sexuality?	Yes	13 (5.35%)
	No	230 (94.65%)
Would you seek counseling if you were to have problems related to sexuality?	Yes	212 (87.24%)
	No	31 (12.76%)

$y_2 \ldots y_k$), while independent variables (directly unobserved impact-measured factors) are defined as X ($x_1, x_2 \ldots x_k$). For FA, the linear combination equation is described as

$$Y_k = W_{k1}X_1 + W_{k2}X_2 + \ldots + W_{kk}X_k \,, \tag{1}$$

where k is the number of common potential factors and W_{ij} is the weighted load of the factors.[34] A linear combination equation is derived from Eq. (1) as

$$X_1 = \lambda_{11}Y_1 + \lambda_{12}Y_2 + \ldots. + \lambda_{1k}Y_k \,, \tag{2}$$

where $Y_i = P^l X_i$, $X_i = P^l Y_i$, and the maximum standardized variance is 1.

Then,

$$X_k - u_k = \lambda_{k1}f_1 + \lambda_{k2}f_2 + \ldots + \lambda_{km}f_m + e_k \,. \tag{3}$$

For reliability and exactness, triangular assessments are computed to analyze and assay the interplays and interactive dependences among factors. Then, the consequent communality of FA is calculated for the analysis of THE.[35] THE is used to define the necessary features of sensor technology and, subsequently, construct the analytical network process (ANP).[34] To calculate THE, a triangular weight pairwise comparison matrix is created for the interaction-compared measurements of each criterion (P_1, $P_2 \ldots P_k$) to obtain discrete probability. The quantitative analysis is then performed as

$$E(P_1, P_2, \ldots, P_k) = -\varnothing_k \sum_{i=1}^{k} P_i In(P_i), \tag{3}$$

where $\phi_k = 1/I(k)$ is the normal quantity, $0 \le \mathrm{E}\left(P_1,\ P_{2,\ldots},P_k\right) \le 1$, and $Y(y_1, y_2 \ldots y_k)$ is reversely associated with the interplays and interactive dependences.

The interplays and interactive dependences can be calculated using the entropy measurement-conditional triangular weights (W_{ij}) as follows.

$$\begin{aligned} H(Y/X) &= \sum_{x \in X} p(x) * H(Y/X = x) \\ &= -\sum_{x \in X} p(x) * p(y/x) \log p(y/x) \\ &= -\sum_{x \in X, y \in Y} p(x,y) \log p(y/x) \\ &= -\sum_{x \in X, y \in Y} p(x,y) \log(p(y/x)/p(x)) \\ &= \sum_{x \in X, y \in Y} p(x,y) \log(p(x)/p(x,y)) \\ &= -\sum_{x \in X} \sum_{y \in Y} p(x,y) \log p(y/x) \end{aligned} \tag{4}$$

After conducting FA and THE analysis, AHP was conducted with alternatives, criteria, and subcriteria. For AHP, ANP is constructed to manage the relationships between alternatives, criteria, and subcriteria in a series of pairwise-compared matrices. The initial pairwise-compared matrix is constructed as follows.

$$\begin{pmatrix} 1 & ..a_{1j} & \ldots..a_{1n} \\ \ldots & \ldots & \ldots \\ a_{i1} & \ldots a_{ij} & \ldots a_{in} \\ \ldots & \ldots & \ldots \\ a_{n1} & ..a_{nj} & \ldots 1 \end{pmatrix} = \begin{pmatrix} \frac{w_1}{w_1} & ..\frac{w_1}{w_j} & \ldots..\frac{w_1}{w_j} \\ \ldots & \ldots & \ldots \\ \frac{w_i}{w_1} & ..\frac{w_i}{w_j} & \ldots\frac{w_i}{w_n} \\ \ldots & \ldots & \ldots \\ \frac{w_n}{w_1} & ..\frac{w_n}{w_j} & \ldots\frac{w_n}{w_n} \end{pmatrix} \tag{5}$$

This matrix contains the measured weight (W_k) and pairwise ratio (W_i/W_j). There are three elements in the initial pairwise-compared matrix as follows:

$$A_{ij} = W_i \,/\, W_j \,,\ a_{ij} = 1 \text{ for } i{=}j, \text{ and } a_{ij} * a_{ji} = 1, \tag{6}$$

where W is the matrix of relative pairwise weights and is calculated using $AW = \lambda_{max}$.

The relative pairwise weights (W = [W_1, …,W_j, …W_n]) and the local priority vector w (eigenvector) are measured by the vector quantities method (AW = nW) in accordance with the inductive principle ($AW = \lambda_{max}$). Consequently, the priority vector and maximized eigenvalue are obtained using the matrix. To verify the consistency of the initial pairwise-compared matrix in the ANP model, the two-stage algorithm is created as

$$Rw = \lambda_{\max} w_i w_j = \sum_{j=1}^{m} (R_{ij} \,/ \sum_{i=1}^{m} R_{ij}) \,/ m\,. \tag{7}$$

The consistency index (CI) is measured in each initial pairwise-compared matrix, and the consistency ratio (CR) is estimated using the CI and random index (RI). [36]

$$CI = {(\lambda_{\max} - n)} \big/ {(n-1)}$$
$$CR = CI \,/\, RI \tag{8}$$

For the ANP model, high consistency is represented by a CR lower than 0.1.[37]

3. Results and Discussion

The experts agreed on the following criteria: the use of innovative sensor technology, the user's perception of the technology, and social identity for gender problems. The innovative sensor technologies for GD diagnosis and evaluation, such as photosensitive, electricity, dynamic, body temperature, blood pressure, and blood oxygen sensors, were considered as the subcriteria of technological features.[27] Information search, net-surfing-orientated reading, and self-experience were important in determining the user's acceptance of the technology and were related to various activities using the Internet, such as communication through emails, playing Internet games, and online shopping. Therefore, subcriteria for the FT were defined by the experts as distinctive user goals, prompt feedback to activities, a balance between circumstance and personal skills, interfusion between individual consciousness and actions, the renouncing of distracting thoughts, no worry about failure, loss of self-consciousness, time perception distortion, and purpose in behaviors. In the SIT, gender problems (social approval, social reinforcement, social exchange, social categorization, and social comparison) were considered. The alternatives were selected in the TAM and included the ATU, BIU, and ASU. All criteria, subcriteria, and alternatives for the ANP are presented in Table 2.

Table 2
Criteria and subcriteria defined by experts in ANP model.

Criteria	Innovative sensor technology	User's perception of the technology	Social identity for gender problems
Subcriteria	Photosensitive sensor (I1)	Distinctive user goals (F1)	Social approval (S1)
	Electricity sensor (I2)	Prompt feedback on activities (F2)	Social reinforcement (S2)
	Dynamic sensor (I3)	Balance between circumstance and personal skills (F3)	Social exchange (S3)
	Body temperature sensor (I4)	Interfusion between individual consciousness and actions (F4)	Social categorization (S4)
	Blood pressure sensor (I5)	Renouncing distracting thoughts (F5)	Social comparison (S5)
	Blood oxygen sensor (I6)	No worry about failure (F6)	
		Loss of self-consciousness (F7)	
		Time perception distortion (F8)	
		Own purpose in behaviors (F9)	
Alternatives		Attitude toward using technology (ATU) Behavioral intention to use (BIU) Actual system use (ASU)	

3.1 Factor analysis

Table 3 shows the results of the Kaiser–Meyer–Olkin (KMO) and Bartlett's test. The sampling adequacy was 0.725 at a significance level of 0.000. This result indicated that factor analysis was appropriate for analyzing the data from the questionnaire. Table 4 shows that the consistency index and consistency ratio were less than 0.1, indicating reliable consistency in the survey results.

Table 5 lists the communalities of the criteria and subcriteria. The communalities ranged from 0.614 to 0.754, which indicated associated dependences among the criteria and subcriteria and that the variances of the factors could be explained by them.

3.2 THE analysis

The communalities were used to evaluate the validity and representativeness of the criteria and subcriteria. The results of THE analysis showed the highest weights of I3 (0.1383) and S3 against F1 (0.1203); I1 (0.1326) against F3; I2 (0.1033), I4 (0.136), I5 (0.1524), S3 (0.1352), S3 (0.1287), I1 (0.1158), and S4 (0.1114) against F5; I1 (0.1356), I3 (0.1779), I4 (0.131), I4 (0.1279), I6 (0.1649), S4 (0.1012), and S5 (0.1206) against F6; I6 (0.1125), I6 (0.1151), and S5 (0.1127) against F7; I6 (0.1302), S4 (0.1151), and S5 (0.1039) against F8; and I2 (0.1331), S4 (0.1082), and S5 (0.1274) against F9. These results showed that innovative sensor technology is important in the users' perception of the use of the technology for GD diagnosis. In particular, interfusion between individual consciousness (F4) and actions (F4) and no worry about failure (F6) were significantly related to sensor technology. For social identity, social categorization (S4) and social comparison (S5) were important in the users' perception of the technology. This showed that the respondents expected that the technology could provide a reliable diagnosis for GD and worried about the comparison and classification for gender identification.

Table 3
KMO and Bartlett's test for factor analysis.

Sampling adequacy		0.725
Bartlett test of sphericity	Chi-squared test	557.084
	df	171
	Significance	0.000

Table 4
Consistency index and consistency ratio of factors in ANP model.

Variables		Consistency Index	Consistency Ratio
Alternatives	ATU	0.0468	0.0807
	BIU	0.0518	0.0893
	ASU	0.0437	0.0754
Criteria	Innovative sensor technology	0.0449	0.0775
	User's perception of the technology	0.0541	0.0933
	Social identity for gender problems	0.0552	0.0952
Subcriteria	I1	0.0529	0.0913
	I2	0.0471	0.0813
	I3	0.0518	0.0892
	I4	0.0533	0.0919
	I4	0.0366	0.0632
	I5	0.0557	0.096
	S1	0.055	0.0949
	S2	0.0535	0.0922
	S3	0.0568	0.0979
	S4	0.0544	0.0938
	S5	0.0544	0.0938
	F4	0.0443	0.0765
	F6	0.0552	0.0951

Table 5
Communalities of criteria.

Criteria and subcriteria	I1	I2	I3	I4	I5	I6	F1	F2	F3	F4
Communality	0.615	0.655	0.647	0.629	0.614	0.625	0.667	0.675	0.673	0.675
Criteria and subcriteria	F5	F6	F7	F8	F9	S1	S2	S3	S4	S5
Communality	0.653	0.688	0.635	0.728	0.634	0.657	0.637	0.625	0.754	0.732

(Extraction method: principal component analysis)

3.3 AHP analysis

The consistency ratio and consistency index for the criteria and subcriteria were less than 0.1, implying that they were independent of each other (Table 6). Thus, the pairwise-compared matrix was created, and the weights of the criteria and subcriteria were calculated as presented in Table 7. The weight of actual system use was the highest, followed by behavioral intention to use and attitude toward using technology. The result showed that the participants focused more on the actual use of the technology for GD diagnosis and evaluation, and they expected that the technology would help people identify gender characteristics more precisely with reliability.

Table 6
Weights of criteria and subcriteria in THE analysis.

Innovative sensor technology						User's perception of the technology	Social identity for gender problems				
I1 (0.785)	I2 (0.755)	I3 (0.747)	I4 (0.698)	I5 (0.681)	I6 (0.681)		S1 (0.657)	S2 (0.637)	S3 (0.625)	S4 (0.754)	S5 (0.732)
0.097	0.1033	0.1383	0.0806	0.1232	0.09	F1 (0.667)	0.0939	0.009	0.1203	0.0967	0.017
0.078	0.0647	0.1033	0.0653	0.0578	0.0792	F2 (0.675)	0.0382	0.0036	0.0888	0.0956	0.1317
0.1326	0.0251	0.0818	0.041	0.0977	0.0855	F3 (0.673)	0.0278	0.0028	0.0265	0.0742	0.0865
0.0915	0.1375	0.0249	0.136	0.1524	0.0649	F4 (0.675)	0.0759	0.0059	0.1352	0.1287	0.1583
0.1158	0.0706	0.0147	0.0937	0.0079	0.0168	F5 (0.653)	0.0201	0.0007	0.0142	0.1114	0.0301
0.1356	0.0779	0.1779	0.131	0.1279	0.1649	F6 (0.688)	0.0999	0.0192	0.1087	0.1012	0.1206
0.0675	0.0781	0.079	0.0945	0.086	0.1125	F7 (0.635)	0.0414	0.0013	0.0898	0.0284	0.1127
0.0754	0.0697	0.1681	0.0705	0.0624	0.1302	F8 (0.728)	0.0612	0.0099	0.1151	0.0703	0.1039
0.0674	0.1331	0.0852	0.0227	0.0136	0.0874	F9 (0.634)	0.0486	0.0081	0.0897	0.1082	0.1274

Table 7
Weights of criteria and subcriteria in the AHP model.

Alternatives		Attitude toward using technology		Behavioral intention to use		Actual system use	
Criteria (weight)	Subcriteria	Weight	Score	Weight	Score	Weight	Score
Social identity for gender problems (0.0611)	S1	0.0598	0.0006	0.2166	0.0022	0.7236	0.0073
	S2	0.0559	0.0055	0.2127	0.021	0.7314	0.0722
	S3	0.0672	0.0006	0.2307	0.0019	0.7021	0.0058
	S4	0.0607	0.0007	0.22	0.0024	0.7193	0.0078
	S5	0.0621	0.0005	0.2134	0.0018	0.7245	0.0061
User's perception of the technology (0.2111)	F4	0.0578	0.0067	0.206	0.0237	0.7363	0.0848
	F6	0.0617	0.0061	0.215	0.0212	0.7233	0.0712
Innovative sensor technology (0.7278)	I1	0.0632	0.0006	0.2191	0.002	0.7177	0.0067
	I2	0.0588	0.0281	0.2202	0.1053	0.7211	0.3448
	I3	0.0567	0.0279	0.2137	0.105	0.7296	0.3584
	I4	0.056	0.0008	0.211	0.0029	0.733	0.0102
	I5	0.06	0.0056	0.2195	0.0206	0.7205	0.0675
	I6	0.0587	0.0085	0.2115	0.0307	0.7299	0.106
Weight		0.0582		0.2154		0.7264	

4. Conclusions and Recommendations

Using sensor technology in interdisciplinary research is becoming more increasingly popular than before owing to its rapid development. Sensor technology is used to measure various physical and physiological signals associated with social problems. Recent studies stated that differences in brain structure or function, hormone level, and pupillary response to visual stimuli may be correlated with gender identification. However, it is important to note that human gender characteristics are complex with multifaceted aspects of human identity that cannot be confined to any single biological or physiological factor. Thus, sensor technology can assist individuals to explore or predict gender characteristics without any effect of human stereotypes based on cultural background and gender recognition in society.

In this research, we tried to determine how people recognize and accept the use of sensor technology for identifying individual gender characteristics. Using the TAM, FT, and SIT, we constructed an ANP model to evaluate the acceptance of the technology for GD diagnosis and evaluation. We invited 20 experts from related industry and academia and recruited 243 participants from higher educational institutions for the interview and questionnaire survey, respectively. Through the interviews with the experts, three alternatives (attitude toward using technology, behavioral intention to use, and actual system use), three criteria (innovative sensor technology, user's perception of the technology, and social identity for gender problems), and 20 subcriteria were identified. The subcriteria in each criterion include innovative sensor technologies (photosensitive, electricity, dynamic, body temperature, blood pressure, and blood oxygen sensors), behaviors in the user's perception of the technology (distinctive user goals, prompt feedback on activities, a balance between circumstance and personal skills, interfusion between individual consciousness and actions, renouncing distracting thoughts, no worry about failure, loss of self-consciousness, time perception distortion, and own purpose), and social identity for gender problems (social approval, social reinforcement, social exchange, social categorization, and social comparison).

The analysis results showed that sensor technology is important in the users' perception of the technology for GD diagnosis as it enables the easy identification of gender characteristics. The participants expected that the technology could provide a reliable diagnostic method for GD and solve problems related to gender identification. Also, they focused more on the actual use of the technology for GD diagnosis and evaluation, and they expected that the technology would allow a more precise and reliable GD diagnosis. The results of this study imply that sensor technology can be used for solving social problems related to GD and related behavioral control. Sensors measuring the vital signs and psychological disturbances were regarded to be important for the psychological and physical assessments of GD patients so that people would not feel shame and embarrassment during the diagnosis process by counselors or medical staff as sensor technology would enable telemedicine. As this research was only the first innovative and interdisciplinary investigation of the use of sensor technology and its impact on social theories, more sophisticated research is needed in the future. More effective theories and efficient methods using sensor technology are required to provide possible outcomes and findings.

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