CYBORG ACCEPTANCE IN HEALTHCARE SERVICES: THE USE OF CYBORG AS A SURGEON

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ABSTRACT

The acceptance of using cyborg technology, which is a result of combining the human biological body with insideables or/and wearables technologies, is still under investigation, and the acceptance of the services that could be offered by cyborg itself hasn't been investigated yet. This research focuses on the factors that could impact cyborg acceptance in healthcare services. In particular, a model was developed to investigate the intention to choose cyborg as a surgeon to correct the visual impairment in one eye. The PLS-SEM technique was used to test the proposed hypotheses. The proposed model's explanatory power concerning the intention to choose cyborg surgeon is high ($R^2 = 0.77$). The results confirmed the impact of effort expectancy, performance expectancy, social influence, and arousal emotional dimension on the intention to choose cyborg services. In contrast, pleasure emotional dimension, empathy, and perceived risk were not found to have any significant impact on the intention to choose the proposed cyborg surgeon. Further research is required to test the proposed model in different countries and different service settings.

INTRODUCTION

The emergence of technological implants for therapy and improvement of human capabilities opens a new era in human-machine interaction. The term cyborg (Cybernetic Organism) is introducing the human with new capabilities, by using wearables or by implanting electronic devices into humans' body (Enno Park, 2014). Most of the developed implantable devices across the past decade have been utilized for the healthcare applications, such as paralyzed limbs control, pacemakers, and cochlear (Raatikainen et al., 2015), and some of these devices are being used to enhance human capabilities, such as memory, vision, hearing, physical strength, and moral enhancement (Reinares-Lara et al., 2016). For instance, radio frequency identification (RFID) chips can be implanted under human skin to be used for access control, personal identification, credit card, and mobile payments by using near-field communication (NFC) technology (Adam & Wilkes, 2016). Furthermore, the cochlear implants (CI) represent the first interaction between the human brain and the machines to replace the lost sounds by allowing the brain to recover the sense of hearing. Also, it could be used to enhance the hearing ability of healthy people (Christie & Bloustien, 2010). On the other hand, technological tattoos, fitness trackers, smartwatches, and smart glasses are representing some examples of wearables technology (Firger, 2015). This development requires to investigate customer behavior toward such technologies. In this sense, the use of technological implants in therapy application has been accepted by society and the use of them to improve human capabilities has been partially accepted. Further investigations are ongoing to be able to understand the factors that could stimulate the acceptance of such technologies (Pelegrín-Borondo et al., 2018).

Eventually, these developments in wearables and insideables to create the cyborg are pointing out to an important concern about how the interaction would be between biological bodies and technological devices, the information processing caused by this interaction, and the impact of this interaction on the environment (Greiner, 2014). Moreover, not much is known about the moral attitude of people toward the ratio between risk and benefits of using such technology and about their preferences, expectations, and needs. Meanwhile, the acceptance may be shifted from a positive to a negative state, as the use of cyborg technologies will be shifted from therapy to enhancement purposes. For instance, CI could be considered a therapy device if the user is deaf. If not, it would be considered an enhancement. The successes of these technologies will depend on the offered benefits and people's perception of these benefits (Schicktanz et al., 2015). In parallel, once these entities (i.e., Cyborgs) become realistic and as proposed, how will humans perceive cyborg individuals in their society? Are they going to accept their existence? Are they going to interact with them normally? And suppose that cyborg will become an employee in any service setting, are people willing to accept the services offered by cyborg? Could they prefer it over human services, for instance? Accordingly, the research aims to investigate the factors that influence cyborg acceptance as an entity in society, especially in healthcare services and as a surgeon. Thus, the research developed a theoretical model to investigate the intention to choose cyborg services in the healthcare sector, considering the technological and human sides of the proposed cyborg. This model will open a new line of research in this context and will be a starting point for the researchers who are interested in studying this domain.

LITERATURE REVIEW AND HYPOTHESIS

In terms of technology, the enhancement could be visible (wearables) or invisible (Implants). Moreover, it could be organic, mechanical, or a combination of both of them. In Fact, using technological implants to create a cyborg will keep the enhanced human to look like a normal one. This means and from the appearance perspective, the enhanced humans will avoid the negative social response that could be associated with their abnormal looks (West, 2016). Consequently, the acceptance of cyborg could be unlike the machines' acceptance (e.g., robot), because the cyborg is still a human with enhanced capabilities that are beyond the normality. However, to make a complete picture, it is necessary to study cyborg acceptance from both perspectives: as a machine and as a human, since in both cases (i.e., implants and wearables), technology is the major part of the enhanced human's body.

Even though cyborg technology is still in its development stage, there are some examples and attempts to implement cyborg technology. For instance, "Neil Harbisson" has color blindness. Neil now can hear the colors through a camera placed on the front of his face. The camera captures the colors as visual signals and sends them to a chip located on the back of Neil's head. Then the chip converts the visual signals into sound waves. And through these sounds, his brain can distinguish between different colors. This "Eyeborg" gives Neil the ability to recognize colors that can be perceived by normal humans and the colors that laid beyond human vision ability. Neil is considered the first official cyborg because his Eyeborg is shown in his passport photo (Parkhurst, 2012). In fact, Neil's journey was not easy with that Eyeborg. He mentioned through an interview with BBC News that two police officers attacked him when he was visiting Paris. They thought he was filming them, and even after he told them it is for hearing sounds, they thought he was laughing at them and they crashed his Eyeborg (BBC, 2012). Actually, the literature showed how technological awareness can reduce the possibility of rejecting new technologies (Mutahar et al., 2018). In this context, special programs and campaigns could be required to increase public awareness regarding the new technologies in terms of their potential benefits for humanity (Kardooni et al., 2016).

The acceptance of new technologies includes some theories about technology acceptance, such as the Technology Acceptance Model (TAM1) for Davis (1985) and its extensions TAM2 (Venkatesh & Davis, 2000) and TAM3 (Venkatesh & Bala, 2008), the Unified Theory of Acceptance and Use of Technology (UTAUT1) for Venkatesh et al. (2003) and its extension UTAUT2 Venkatesh et al. (2012) and the Cognitive-Affective-Normative Model (CAN) for Pelegrín-Borondo et al. (2016), which has been developed based on the TAM and UTAUT models, to study the acceptance of being a cyborg. The performance expectancy, which is one of the UTAT constructs, is related to the individuals' beliefs about the system's ability to improve their job performance. And effort expectancy is related to the simplicity of using the system (Venkatesh et al., 2003). Human needs to perceive the usefulness of cyborg in terms of its superiority in performance if compared to humans. It can stimulate the acceptance of dealing with cyborgs if the consumers find it better than the other options or stimulate the rejections if there are no differences in terms of performance and outcomes. But it is important also to consider the possibility of the low effect of these two constructs in the initial investigation of cyborg acceptance since the technology is still in its novelty stage (Pelegrín-Borondo, Reinares-Lara, et al., 2017).

Since individuals are members of their social entities, other member's opinions and advice toward any behavior or decision could make a difference and could direct that behavior or decision. Therefore, it makes sense to investigate the effect of social influence while studying the acceptance of new technology (Ajzen, 1991). In fact, this side was studied in technology acceptance literature and it is one of the main constructs of technology acceptance models. The social influence was introduced by the Theory of Reasoned Action (TRA) for Fishbein and Ajzen (1975) and the Theory of Planned Behavior (TPB) for Ajzen (1991). For example, the literature showed the significant impact of this construct on the acceptance of new technologies (Davis, 1989; Venkatesh, 2000). As well, its impact on the acceptance of Nanoimplants (Pelegrín-Borondo et al., 2015, 2016; Pelegrín-Borondo, Reinares-Lara, et al., 2017; Reinares-Lara et al., 2016, 2018), breast augmentation for young women (Moser & Aiken, 2011) and on the acceptance of virtual customer integration (Füller et al., 2010).

Emotions have been considered as a way to distinguish humans from objects and machines. Furthermore, the ability to express basic emotions could be proof of humanity (Heisele et al., 2002). Moreover, as the proposed relation between humans and cyborgs will involve a direct interaction, it is essential to investigate the impact of anxiety emotion on the interaction. Indeed, the expected anxiety is a reflection of the abnormality and superpower associated with cyborg technology. Factually, the anxiety problem is not related to the technology itself, rather than it is an emergence of this negative feeling while interacting with it (Oh et al., 2017). However, changing the attention toward the benefits of the technology could help in reducing the associated anxiety during the interaction process (Reinares-Lara et al., 2016). Meanwhile, some studies claimed that anxiety is not a significant determinant of the intention toward new technologies (Pelegrín-Borondo, Reinares-Lara, et al., 2017; Venkatesh et al., 2003). In the same context, Pelegrín-Borondo et al. (2016) used emotional dimensions: positive and negative emotions in the CAN model to investigate the acceptance of being a cyborg. However, there is some degree of consensus that the arousal and pleasure emotional dimensions are the most adequate dimensions to analyze the emotional response of an individual to a stimulus (Pelegrín-Borondo et al., 2015). The level of emotional pleasure and emotional arousal are the most supported emotional dimensions by literature (Cohen, Pham, & Andrade, 2008; Pelegrín-Borondo et al., 2015; Russell, 1980, 2003). In this sense, Mehrabian and Russell (1974) and Russell and Mehrabian (1977) suggested that you can measure what a person is feeling by employing a limited number of emotional dimensions. They proposed a scale with three dimensions: pleasure, arousal, and dominance (PAD). Eroglu, Machleit, and Davis (2001) recommended using arousal and pleasure only, and without the dominance dimension. They claimed that these two dimensions can represent the range of emotions that emerged in response to environmental stimuli and based on Russell's (1979) recommendation. Pleasure is related to a person's state of feeling of goodness, happiness, joyfulness, or contentedness in a certain situation. And, arousal is about a person's state of feeling with excitement, alert, stimulation, wakefulness, or activeness in a certain situation (Das, 2013; Mehrabian & Russell, 1974). Positive arousal and pleasure emotions can allow humans to feel optimism while choosing their plans and goals. In fact, arousal could be seen as preparation for actions (Russell, 2003). Also, pleasure can affect customer behavior toward a successful choice of a specific service or/and product. Moreover, while using a specific service, customers may develop positive or negative emotions. The positive ones are important for the future behavior of customers (Pappas et al., 2013). Furthermore, they are considered important in directing the attitude of customers toward new technologies, and they can enhance the predictive power of the technology acceptance models (Kulviwat et al., 2007).

Perceived risk (PR) was introduced by Bauer (1960) to the marketing research. It is related to the consumer perception of the uncertainty and adverse outcomes associated with buying a product or a service (Dowling & Staelin, 1994). Pavlou (2003) integrated the PR into the TAM model while studying the acceptance of e-commerce. The research results confirmed the direct impact of the PR on the behavioral intention and use behavior. In the cyborg technology context, using PR in studying the acceptance of such technology could be justified, as the technology is still under development and not much is known about it. For instance, Gao et al. (2015) pointed to the significant negative impact of PR on the intention of using wearable technologies. However, Pelegrin-Borondo et al. (2017) found PR impact on the acceptance of insideable technologies higher than its impact on the wearable ones. Moreover, when benefits exceed the risk that is associated with nanotechnologies, the perception of risk may decrease (Gupta, Fischer, & Frewer, 2015; Satterfield, Kandlikar, Beaudrie, Conti, & Harthorn, 2009).

Empathy can be seen as the degree of caring and attention that employees show to their consumers (Parasuraman et al., 1988), and it has a direct impact on consumers' positive expectations toward service quality (Bebko, 2000). In addition to its role in establishing a successful consumer-employee interaction (Homburg, Wieseke, & Bornemann, 2009). Besides, it is related to understanding consumers' perspectives and interacting with them emotionally (Davis, 1983). In fact, empathy isn't a personal treat as much as it is a skill that can be created and developed to enhance consumer-employee interaction, which may lead to consumer satisfaction (Malle & Pearce, 2001). In the same context, Fugate, Kinicki, and Ashforth (2004) defined adaptability as employees' ability and willingness to modify their feelings, thoughts, and behavior to fit consumer requirements and needs, and it is related to employee empathy too (Kieren & Tallman, 1972). Furthermore, empathy should be taken into consideration during the hiring process, as it has a major influence on the consumers' perception of service value (Namasivayam & Denizci, 2006). For instance, when a salesperson shows a high level of empathy, the consumer satisfaction level could be increased, which in turn could increase their attitude toward the offered product (Stock & Hoyer, 2005). In the technology acceptance context, such as human-robot interaction, humans can convey empathy by imitating the facial expression of the other party (Riek & Robinson, 2008). It could be proposed that this way of conveying empathy should be used in the human-cyborg interactions since the perceived empathy is a significant determinant of the intention towards humanoid technologies (Homburg & Merkle, 2019).

Based on the literature review, we posed the following hypotheses:

H1a: Patients' intention to choose the Cyborg surgeon is positively affected by effort expectancy.

H1b: Patients' intention to choose the Cyborg surgeon is positively affected by performance expectancy.

H2: Patients' intention to choose the Cyborg surgeon is positively affected by a favorable social influence.

H3a: Patients' intention to choose the Cyborg surgeon is positively affected by pleasure.

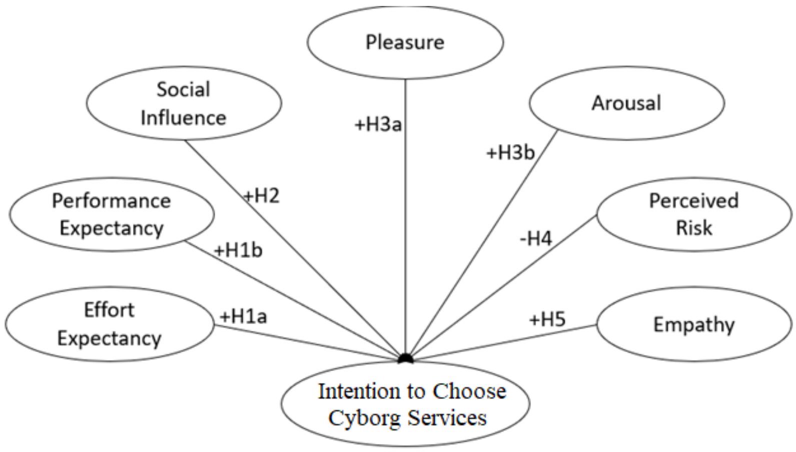
H3b: Patients' intention to choose the Cyborg surgeon is positively affected by arousal.

H4: Patients' intention to choose the Cyborg surgeon is affected negatively by the perceived risk.

H5: Patients' intention to choose the Cyborg surgeon is positively affected by perceived empathy.

A comprehensive theoretical model of variables influencing the intention to choose Cyborg services in the healthcare sector based on the proposed hypotheses is shown in Figure 1.

Figure 3. The Proposed theoretical model.



METHODOLOGY

This research used a quantitative methodology, and the online survey was developed to test research hypotheses using Google Forms. The data were collected from 379 individuals from different Jordanian universities. A total of 53% of the respondents were men, and 47% were women.

The partial least-square structural equation modeling (PLS-SEM) technique was used to examine this research model by using SmartPLS version 3 software. (Hair et al., 2011) recommend using PLS-SEM "if the goal is predicting key target constructs or identifying key 'driver' constructs," (p.144), which is the case in this research. Similarly, other authors suggest that PLS-SEM is appropriate when the research has a predictive purpose and an explanatory purpose (Henseler et al., 2016). Furthermore, PLS-SEM assesses the model relationships in a series of ordinary least squares (OLS) regressions, in order to maximize the explained variance of the endogenous latent variables. The sequence of OLS regressions makes PLS-SEM achieve a higher level of statistical power and lower demand concerning the sample size (Reinartz et al., 2009).

An 11-point scale (0 to 10) was used for the measurement scale, which was developed based on the literature review. The measurement scale developed by Venkatesh and Davis (2000) was used to measure the intention to choose cyborg services, which has been used and validated by various previous technology acceptance studies in different service settings (Chen et al., 2017; Chow et al., 2013; Im, Kim, & Han, 2007; Heijden, 2004) In contrast, the measurement scales for effort expectancy, performance expectancy, and social influence constructs were developed based on Venkatesh et al.

(2012) measurement scale, which has been used in previous studies in technology acceptance for healthcare contexts (Alaiad & Zhou, 2013, 2014; Alaiad et al., 2013; Graaf, Allouch, & Dijk, 2019; Hossain et al., 2019).

The scale that has been used to measure perceived risk was developed based on the scale adopted by Faqih (2016) which was developed by Shim, Eastlick, Lotz, and Warrington (2001) and has been validated by different studies in the technology acceptance context (Pelegrin-Borondo et al., 2017; Yang, Pang, Liu, Yen, & Michael Tarn, 2015).

Regarding the emotional dimensions of arousal and pleasure, the researchers adopted the scale developed by Mazaheri, Richard, and Laroche (2011), and used by Loureiro (2015).This scale has been used also in technology acceptance studies (Chen, Chang, & Chen, 2017; Pelegrín-Borondo, Arias-Oliva, & Olarte-Pascual, 2017; Ruiz-Mafe, Chatzipanagiotou, & Curras-Perez, 2018).

Homburg and Merkle (2019) studied attitudes toward humanoid robots and developed their measurement scale for empathy based on Davis (1983), Hogan, Hogan, and Busch (1984), and Parasuraman, Berry, and Zeithaml (1991). This scale has been used to measure empathy in this research.

The data has been collected randomly from 379 individuals in different Jordanian universities. 47% of the respondents were females and 53% were males, 75% were from the 18-30 age group, and 66% of them are in bachelor degree.

RESULTS

Measurement Model Assessment

The internal consistency reliability of the measurement model has been confirmed since the values of Cronbach's alpha and the composite reliability for all model constructs were higher than 0.70. In addition, the standardized loading of constructs indicators was greater than 0.70 and the t-values were greater than 1.96, to ensure the correct reliability indicator in the measurement model. Regarding convergent validity, all constructs have AVE values greater than 0.50, which confirmed the convergent validity of the measurement model. Table 1 shows loading values, Cronbach’s alpha, and Composite reliability values. For the discriminant validity evaluation, HTMT values were less than 0.90 for all constructs, and the square root of the AVE value for each construct was higher than the correlation value with the other constructs (Table 2).

Table 1. Internal Consistency Reliability & Convergent Validity.

Variable	Indicators	Loading	Cronbach's alpha	Composite reliability	AVE
AR	AR1	0.957	0.907	0.956	.915
	AR2	0.956			
EE	EE1	0.931	0.962	0.972	0.898
	EE2	0.955			
	EE3	0.951			
	EE4	0.954			
EM	EM1	0.871	0.956	0.966	0.852
	EM2	0.897			
	EM3	0.947			
	EM4	0.958			
	EM5	0.939			
IC	IC1	0.977	0.952	0.977	0.954
	IC2	0.977			

PL	PL1	0.952	0.883	0.945	0.895
	PL2	0.940			
PR	PR1	0.970	0.931	0.943	0.848
	PR2	0.923			
	PR3	0.867			
PE	PE1	0.930	0.943	0.959	0.854
	PE2	0.940			
	PE3	0.938			
	PE4	0.886			
SI	SI1	0.948	0.942	0.963	0.896
	SI2	0.958			
	SI3	0.935			

PE: Performance Expectancy, **EE**: Effort Expectancy, **SI**: Social Influence, **PR**: Perceived Risk, **EM**: Empathy, **AR**: Arousal, **PL**: Pleasure, and **IC**: Intention to Choose.

Table 2. Discriminant validity.

Variable	AR	EE	EM	IC	PR	PE	PL	SI
AR	**0.957**	0.743	0.729	0.772	0.095	0.757	0.834	0.744
EE	0.694	**0.948**	0.864	0.876	0.069	0.889	0.729	0.843
EM	0.679	0.829	**0.923**	0.735	0.201	0.797	0.678	0.817
IC	0.717	0.840	0.702	**0.977**	0.059	0.849	0.721	0.819
PR	0.106	0.087	0.197	0.074	**0.921**	0.151	0.100	0.165
PE	0.703	0.852	0.761	0.810	0.163	**0.924**	0.686	0.880
PL	0.748	0.675	0.626	0.663	0.101	0.632	**0.946**	0.691
SI	0.688	0.803	0.776	0.776	0.189	0.831	0.633	**0.947**

Note: Bold font values in diagonal are the square roots of the AVEs below the diagonal: correlations between the constructs, and above the diagonal: HTMT values.

Structural Model Assessment

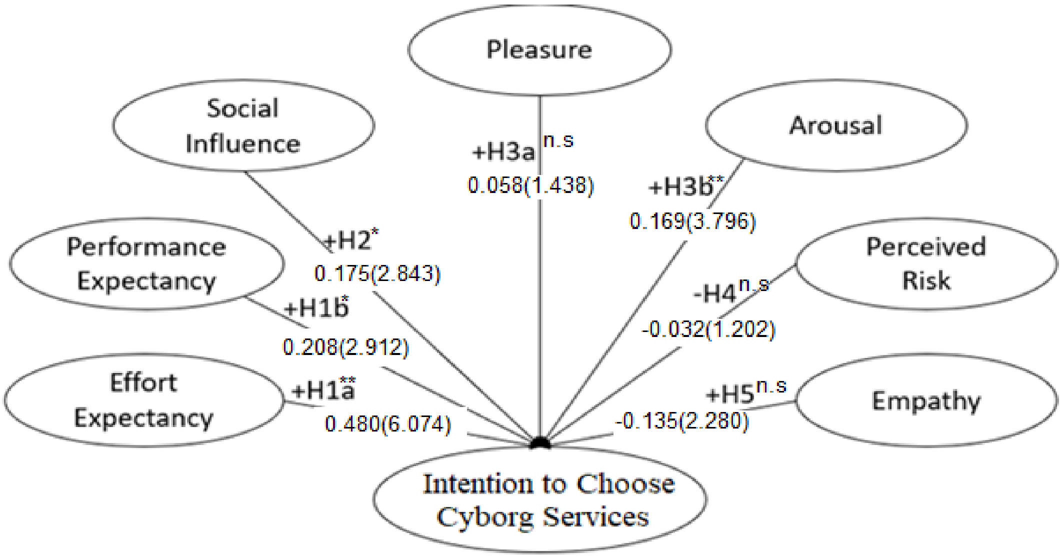
According to the research results for the structural model, H1 (The influence of Effort Expectancy and Performance Expectancy), H2 (The influence of Social Influence), and H3b (The influence of Arousal) were supported. However, H3a (The influence of Pleasure), H4 (The influence of Empathy), and H5 (The influence of Perceived Risk) were rejected, since the path coefficient wasn't significant ($0.01 < p$ and $t < 2.57$). Also, the R^2 value was 0.770, which confirmed the predictive power of the cyborg services model. Finally, Stone-Geisser's Q^2 value was 0.741, which confirmed the predictive relevance of the research model. The value of Q^2, R^2, p-value, t-value, path coefficient and support of hypotheses are shown in Table 3, and the sign, magnitude, and significance of the path coefficients are shown in Figure 2.

Table 3. Path Coefficient of Cyborg Services Hypotheses.

Variable	R^2	Q^2	Path Coefficient	t-value	Decision
Intention to Choose	0.770	0.741			
Arousal -> (+) Intention to Choose			0.169	3.796	Supported**
Effort Expectancy -> (+) Intention to Choose			0.480	6.074	Supported**
Empathy -> (+) Intention to Choose			-0.135	2.280	Not Supported
Perceived Risk -> (+) Intention to Choose			-0.032	1.202	Not Supported
Performance expectancy -> (+) Intention to Choose			0.208	2.912	Supported*
Pleasure -> (+) Intention to Choose			0.058	1.438	Not Supported
Social Influence -> (+) Intention to Choose			0.175	2.843	Supported*

Significant at P**<0.001, P*<0.01.

Figure 4. Sign, Magnitude, and Significance of the Path Coefficients. *p < 0.01; **p < 0.001; n.s = not significant.



DISCUSSION, CONCLUSION, AND IMPLICATIONS

The acceptance of using cyborg technology, which is a result of combining the human biological body with insideables or/and wearables technologies, is still under investigation, and the acceptance of the services that could be offered by cyborg itself hasn't been investigated yet. In this context, nothing is known about the moral attitude of people toward the ratio between risk and benefits of using cyborg services and about their preferences, expectations, and needs (Schicktanz et al., 2015). On the other hand, cyborgs will evolve and alter the workforce and marketplace. What is unclear is the extent of this development and its impact, and how consumers will perceive them in service settings. Thus, the research model has been developed to evaluate the patients' intention toward choosing cyborg services when compared mainly to human surgeons. The model has been built based on the technology acceptance models (e.g., UTAUT, TAM, and CAN models), in addition to integrating empathy, emotional dimensions, and perceived risk into the proposed model.

Based on PLS-SEM results, the cyborg services model can explain 77% of the variance in the intention to choose cyborg in healthcare services. This means the research model is highly predictive of the intention to choose cyborg services. So far, the inclusion of emotional dimension, perceived risk, and empathy into this research model enhanced variance explained values (R^2) when compared, for instance to the values obtained by UTAUT (44%) and CAN (73.9%) models. These results confirmed the value of extending the factors that could determine the new technology acceptance, such as emotional dimension (i.e. consumer pleasure and arousal), consumer perceived risk, and cyborg empathic behavior.

The models assessed performance expectancy, effort expectancy, social influence, empathy, perceived risk, and emotional dimension. Four of the examined variables affected the intention to choose cyborg services, except for perceived risk, empathy, and pleasure. Therefore, H1, H2, and H3b were accepted, but H3a, H4, and H5 were rejected.

According to the research results, the effort expectancy showed the most significant impact on the intention to choose cyborg services in the positive direction (H1a). Where it got the lowest p-value (p<0.001). Meanwhile, it has the highest t-value (6.074), which represents the highest explanatory capacity for the cyborg services model. Performance expectancy (H1b) got a t-value of 2.912, which represents the third-highest score regarding the explanatory capacity of the research model. This is expected because many of the previous studies of cyborg technology acceptance have agreed on the importance of these variables in stimulating the intention to choose such technology. (e.g., Olarte-Pascual et al., 2015; Pelegrín-Borondo, Reinares-Lara, et al., 2017; Pelegrín-Borondo et al., 2016; Reinares-Lara et al., 2016). In addition to that, the differences between these two variables are limited to their impact on behavioral intention in terms of direction and strength of this impact. (Conti et al., 2017, 2015; Graaf et al., 2015). The importance of performance and effort expectancies could be justified because users could consider simplicity and performance efficiency as the most important factors that could stimulate their intention to choose new technologies, especially during the early stages of these technologies' emergence and use (Heerink et al., 2010, 2008, 2009).

The results showed that social influence (H2) has a positive significant impact on the intention to choose cyborg services. It got a p-value of less than 0.01, and t-value equal to 2.843. These results are in line with the previous studies about being cyborg acceptance (e.g., Olarte-Pascual et al., 2015; Pelegrin-Borondo et al., 2017; Pelegrín-Borondo, Reinares-Lara, et al., 2017; Pelegrín-Borondo et al., 2016; Reinares-Lara et al., 2018, 2016). In general, individuals could change their feelings, thoughts, attitudes, or behaviors when communicating with other individuals. Consequently, individuals could build their decisions based on other individuals' suggestions, especially when the service or product is relatively new and/or unknown (Talukder et al., 2019). Hence, the confirmed impact of social influence on the intention to choose the proposed services can justify the importance of others' advice, especially for the cyborg services, which are still in the novelty stage.

The results confirmed the impact of arousal (H3b) on the intention to choose cyborg surgeons, but it didn’t show a significant impact of pleasure emotion (H3a). Whereas, the explanatory capacity of arousal was in the second place and behind effort expectancy ($p<0.001$, $t=3.769$). In the services sector, consumers may require fulfilling their needs from two perspectives: performance and psychological perspectives. The psychological need is related to the consumer's emotions and its importance is dependent on the service nature. For instance, emotions could be considered a major criterion in hospitality services (Lu et al., 2019) and it could not impact surgeon choice (Yahanda et al., 2016). In the same context, pleasure is related to the hedonic motivation to adopt new technologies (Talukder et al., 2019). And since cyborg is a human with advanced capabilities, this could justify why it didn’t show a significant impact on intention to choose cyborg services. On the contrary, the idea of a cyborg surgeon would stimulate excitement feeling toward this future technology, which may justify the significant impact of arousal on intention to choose cyborg surgeon.

The results also didn’t confirm the negative impact of perceived risk (H4) on the intention to choose cyborg services. In fact, few studies about insideables and wearables acceptance have integrated the perceived risk into their research models. For instance, Yang et al. (2016) studied the impact of perceived risk on the intention to use wearable technology and their research results confirmed its negative impact. Contrariwise, Murata, Arias-Oliva, and Pelegrín-Borondo (2019) didn’t find a significant impact of the said construct on the acceptance to become a cyborg. In general, the inverse relation between expected benefits and risk could explain the results (Featherman, 2001; Gupta et al., 2015; Satterfield et al., 2009), because the cyborg is still a human with advanced capabilities that could be considered an opportunity to get better healthcare services, not a threat. In other words, patient perception of the cyborg benefits could reduce their perception of the associated risk while choosing a cyborg surgeon (Gupta et al., 2015). Meanwhile, the human side of the proposed cyborg surgeon could reduce the perceived risk and the uncertainty if the alternative is a technology (e.g., robots surgeon).

The result didn't show a significant impact of empathy (H5) on the intention to choose cyborg services. Actually, empathy is a skill that can be gained and developed and not a personal trait. However, in some service settings, it could be considered a significant driver of consumer purchase behavior, especially when direct interaction between employees and consumers is involved. Because the consumers in such settings expect the employee to understand their needs and to act accordingly (Malle & Pearce, 2001). Additionally, empathy has been integrated into the service quality model to investigate gaps between consumer expectations and perception of service quality (Purcarea et al., 2013). As well, in some service settings, professionalism could be considered the most important determinant of choice criteria, such as in healthcare services, which could minimize the importance of empathy on the choice decision (Wu et al., 2015). Precisely, the impact of empathy could be significant while choosing primary care physicians and psychiatrists, not the surgeons (Dehning et al., 2014; Nadi et al., 2016).

This research opens a new line of researches related to the acceptance of cyborg technology as an entity. In this regard, few studies have been conducted to investigate cyborg acceptance, which supported the companies in promoting their related products (i.e. wearables and implants) and understanding the factors stimulating their acceptance. At the same time, the acceptance of the proposed cyborg services will help the service providers to know the factors that can lead to the acceptance of hiring cyborg in a specific service setting. As a result, the developers and manufacturers of cyborg products can build their designs to match consumers' needs and based on their expectations of these enhancements. For instance, the results confirmed the impact of effort expectancy, performance expectancy, social influence, and arousal on the acceptance of the proposed cyborg services. Publicizing awareness about the simplicity in dealing and interacting with cyborgs and the superiority of their performance will be required to convince society about accepting cyborg services. In addition to that, to be served by an enhanced human could make consumers excited about the idea itself. This consequently requires reinforcing those emotions by promoting the superior capabilities of cyborg.

LIMITATIONS

One of the research limitations is related to investigate the ethical impact while studying the acceptance of such technology. Cyborg surgeons are representing an advanced technology that may have the ability to imitate and/or exceed human abilities. If these futuristic surgeons become a reality, they will compete with human surgeons and could eventually replace them. Thereby, increasing the professional and social gap between humans on one side, robots, and enhanced humans on the other side. Another ethical concern is, if these advanced surgeons are available for high-income consumers, it could create a new social class that can buy the proposed superior services. This could consequently increase the equity gap too. Furthermore, the study has been conducted in a single country. The differences in culture could affect consumers' intentions toward cyborg technology. According to that, this research should be extended to different countries for evaluating the impact of cultural differences on the intention to choose the proposed services. In addition, consumers' knowledge about cyborg technology is limited. Therefore, this research results represented a general belief of the consumers about advanced technologies. Even though the proposed services are still under the development stage, enhancing respondents' awareness about these technologies could affect their perception of the proposed services. Consequently, future research could investigate whether providing participants more information about these technologies before the data collection process - through, for instance, video demonstrations and prototypes – can impact their perception towards cyborg services and their intention to adopt them. In the same context, this research proposed a specific use of cyborg technology. The result could vary if the proposed use is conducted in different service settings. Therefore, future research could apply this research model to different service settings.

KEYWORDS: Cyborg. Healthcare Services, Technology Acceptance, Intention to Choose.

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