

ADOPTING WEARABLES AND INSIDEABLES TECHNOLOGIES: WHAT IS THE MAIN FACTOR INFLUENCING IN MEXICAN YOUNGSTERS?

Juan Carlos Yáñez Luna, Pedro Isidoro González Ramírez, Mario Arias-Oliva, Jorge Pelegrín-Borondo

Universidad Autónoma de San Luis Potosí (México), Universidad Autónoma de San Luis Potosí (México), Universitat Rovira i Virgili (Spain), University of La Rioja (Spain)

jcyl@uaslp.mx; pedro.gonzalez@uaslp.mx; mario.arias@urv.cat; jorge.pelegrin@unirioja.es

ABSTRACT

This paper analyses the ethical perception of adopting and using wearables or insideables. We collected 152 samples from youngsters in San Luis Potosí (Mexico), most of them undergraduate students. An online survey was adapted based on (Pelegrín-Borondo & Arias-Oliva, 2017) to collect students' data and were analysed in the computational software STATA 25. We analyse the effects of two factors: social influence and performance expectancy on intention to use. Also, we analyse the effect of the "consumer innovative" on gender factor. Our results show that there is positive relation between variables, but in special those that relate to wearables. That means Mexican youngsters prefer to use wearables to insideables. Also, the study shows that there is a slight difference between the degree of innovative consumer between men and women.

KEYWORDS: Social Influence, Consumer Innovative, Ethics, Wearables, Insideables.

1. INTRODUCTION

People that were born in the last century, have never thought that technology could be an important part of their lives. Nowadays, it is a fact that youngsters adopt technology earlier (digital natives) than elderly people. People uses technologies in their day to day (Smartphone, Tablet, Computers, Internet of things, etc.) as a part of their work or as a part of their leisure activities, but, why does they do?, which are the factors that have influence on them?. An important challenge of markets in the world is to identify some of the factors that have influence in the consumer behaviour. This activity sets a framework of conditions which allow businesses to compete, innovate and create jobs;(Porter, 2008) in other words, create competitive advantages.

In this respect, globalization has enabled technology industries increase production and trade throughout the world. Most of the technological gadgets are produced in developing countries such as China, Taiwan, Chile, Brazil, etc., this allows to reduce manufacturing costs and increase its production to seek greater competitiveness. In the case of technologies focused to mobility such as Smartphones, gadgets, etc., every year companies develop new and sophisticated technologies with Internet as a common media. Companies are also working in the topics of Artificial intelligence (McLean & Osei-Frimpong, 2019), also in wearables (Fröbel, Avramidis, & Joost, 2019) and insideables or implants (Haeberle et al., 2019). Most of them requires Internet or the Smartphone to work adequately, but recent technologies works with, a set of data who interpret the environment and take appropriate decision; well known as Artificial Intelligence (AI). We can imagine a near future in which the use of devices with AI will improve the human disabilities such as physical or mental defects

through a set of microcircuits implanted and managed (or not) by external devices like wearables. The acceptance of technology for improve the human abilities or disabilities is a complicated topic specially in social context. In the one hand, many individuals believe in the use of technology for transform their lives and to increase their welfare, on the other, many people make their lives in a strict order based in culture, religion or others social structures. In this regard, marketers, economists or decision takers in the business and government should study that more this topic in order to take steps that affect their economy.

1.1. Technology consumerism

During the first decades of the 21st century, technologies managed to integrate into existing information processes. The paradigm of the knowledge society was consolidated in some countries (Castro-Jaramillo, Guevara-Valencia, & Jaramillo-Rojas, 2016). The prominence of technologies in everyday life generate a new reality in societies. Mobility is now a life partner of the human being practically from birth to death.

Today's society is considered as productive and recurrent to information. All this information is transformed into knowledge. For companies, the generation of knowledge is convenient since it can establish their competitive advantages in their environment or beyond their borders. However, the consumer does not always consider that it is part of the strategies of business, of marketing to turn him into an innovative consumer.

According with Fresneda Lorente, (2019), the consumerism of electronic technologies will be increased in the 2020, a total of 20% of technology revenue is expected. Most of the consumerism in technologies focuses on wearables for health (52% of sales of wearables in the world) and the 39% will represent to health gadgets, such as Fitness bracelets or Smartwatches.

According to Garibay (2018), in Mexico 51.9% of individuals adopted and uses at least 3 gadgets; Likewise, the report of Interactive Advertising Bureau México (2019) shows that the acceptance of wearables and virtual reality grew up at least 15% in relation with previous years. We can assume that the penetration of technologies especially mobile or internet based, will continue growing exponentially, and it is possible that the consumers behaviour changes in the future. In relation with previous cited the penetration of wearables in the world has increased to 38% for people between 25-34 years old (Escamilla, 2019).

The implants business in Mexico focus mainly in Cosmetic and Health context. According with Rios Montanez (2020) in Mexico, the number of "cosmetic" procedures (surgical and non-surgical) increased by approximately 32% between 2014 and 2018. The technological implants in Mexico is not common as other kind of surgical intervention, this may due to certain factors such as, expensive technology, expensive surgeries, lack of knowledge about the topic or culture and religion impediments.

The consumption of products is a fundamental part for jump-starting the markets in order to rise an economic development sustainable, however most of Mexican do not have the financial solvency for acquiring forefront technology (gadgets – wearables, implants or mobile) due principally to additional duties of importation and foreign i+D added costs. Most of the technology acquired in Mexico is imported from different countries in which has trade agreements.

In their last meeting (in México), the OECD countries established certain objectives in order to increase the digital transformation of services in each country (OECD, 2017). In the case of México, the amount for invest in Technology and Innovation is less than 1% of the Gross Domestic Product (GDP) in

comparison with others OECD countries that invest more than 20% (Camhaji, 2017). This situation leads to economic stagnation and under development. Consequently, the growth of the country will be diminished for a lack of knowledge development; and as is augmented in Cabrero Mendoza (2017) "The knowledge-based economy refers to the ability to generate scientific and technological knowledge, which allows to be more competitive, grow more, and transform the economy to achieve higher levels of social welfare".

Mexican government approved fiscal incentives to facilitate the consumerism of technology in all economic sectors. Those incentives could provide facilities to companies for save almost 94% of the investment in technology (Neuman, 2017). But for individuals to acquire forefront technology is still expensive, Mexican (specifically youngsters from mid-sized class) decide for purchasing cheaper technology such as low range wearables. Despite cuts in the budget, Universities and Research Institutions in Mexico have been working in i+D. The principal aims in the research is the generation of biomaterials that could impact in the individuals' needs (Manjarrez Nevárez et al., 2017).

The proposal of this research is to analyse the perceptions about the acceptance of wearables or technological implants (insideables) by Mexican citizens. We also consider how the transhumanism concept influences in the consumer consumption of technologies and how influences in their ethical behaviour.

2. ACCEPTANCE OF TECHNOLOGY

The acceptance of products developed by an industry is an important element for the improvement of market strategies. The technology industry is characterized by having high demand; however, it is not an industry characterized by having affordable prices, at least during its first years on the market. This is because in many cases technological products can be considered as luxury products, that is, they are not necessary goods. The economy explains through the law of supply and demand the behaviour of the markets (the interaction between buyers and sellers). This model describes the effects that exist between the price of a good and the relationship between the availability and the degree of demand for that good in the market. However, for there to be a demand, that product may need to be well diffused.

According to the theory of diffusion of innovations (Rogers, 1983), an innovation will depend on various factors, such as ease of use, price, return on investment, expected benefits, among others. The importance of investigating these factors is to determine the degree of adoption that a product will have in the market and in each time. But it is particularly complicate to measure the degree of adoption between Period 1 (actual) and Period 2 (near future). Most organizations aim to market their products or services. However, not all companies are conceptualized in this regard. The most widely accepted classification in the literature is in accordance with the degree of innovation or adoption of technologies, such as pioneers, followers and reluctant (Aguilar Jimenez, Gamboa Pico, & Rueda Díaz, 2011). Currently, the pioneering companies are threatened by the dynamism of the market. This dynamism considerably reduces the market leadership of pioneers (Audretsch & Callejón Forniellas, 2007), therefore, achieving rapid profits is fundamentally aware of the challenges in the markets.

On the other hand, the production of technologies and the interaction with telecommunications have opened new business environments. The health and cosmetic market is one of the majority covered in terms of implants (Foerster, Cantu, Wildman, & Tuck, 2019; Wei, 2014). From a business perspective, companies must take advantage of the aspect that covers social thought, in which human beings always seek to satisfy their needs for well-being and comfort (Velázquez Fernández, 2009).

In this regard, there are certain factors that influence consumer behaviour and that have direct implications for their decision to adopt a technology. Various studies have been carried out on the acceptance of technology under different contexts, for example, the social influence, utility / application and ease of use are the most common in this type of study (Fred D. Davis, 1989; Venkatesh & Bala, 2008), other researchers seek to observe hedonic aspects (McLean & Osei-Frimpong, 2019), ethical and moral aspects (Gauttier, 2019; Pelegrín-Borondo, Arias-Oliva, Murata, & Souto-Romero, 2018), consumer perceptions of risk (M.-C. Lee, 2009; Shin, 2010), and innovation (Murata, Arias-Oliva, & Pelegrín-Borondo, 2019).

The academic literature has covered different fields of study of consumer behaviour. Y.-H. Lee, Hsieh, & Hsu (2011) considered an early introduction of new technologies may generate several degrees of uncertainty in the individual. The uncertainty is an element for measure the perceived risk and trust in the individual in the purchase decision (Pelaez, Chen, & Chen, 2019). In this regard, it is usually observed that the perceived risk can be a factor that have implications with those considered important, such as the Perceived trust, perceived utility, or the intention of use (M.-C. Lee, 2009; Shin, 2010). Although the perceived risk is directly related with the previous factors, it is important for the theoretical literature to develop studies of how morality and ethics influences in the perceived risk.

As discussed above, understanding consumer influencing factors is important in behavioural studies. Other areas such as psychology and sociology have also contributed to the theoretical context arguing intrinsic and extrinsic motivators. According to F. D. Davis, Bagozzi, & Warshaw (1989) extrinsic motivators influence behaviour with a proportional amount of effort, intrinsic motivators have influences on the performance of an activity and there is no effort present. In this type of model, the variables are regularly classified according to their order of motivation, pouring their influence on the perceived utility or on the intention of use.

Sociology, in general, indicates that the behaviour of an individual lies in the degree of satisfaction of their needs, such as social needs and the influence with the regulations of the individual. Social norms, Image, Social Influence, are factors that are regularly applied in the same context, Venkatesh, Morris, Davis, & Davis (2003) indicate that Social Influence is defined as: "the degree to which an individual perceives that important others believe he or she should use the new system ". Acceptance studies have been carried out of technologies that evaluate the relationship between social influence and other factors such as facilitating conditions (Koo & Chung, 2014; Sugarhood, Wherton, Procter, Hinder, & Greenhalgh, 2014; Zhou, Lu, & Wang, 2010), their results indicate a positive influence on relationship with the intention of use.

The theory of technology acceptance indicates that the individual expects that the adopted technology will fully satisfy his need. This satisfaction will generate a useful perspective or a perception of improvement in the performance of their activities. One of the factors that measure this satisfaction is the expectation of performance, which is defined as the rate at which an individual considers that using a technology will help them to obtain profits in their job performance (Venkatesh et al., 2003). The implications of adopting a technology will have to be denoted. This factor can be studied from a social perspective and a business perspective. In both perspectives, it can be considered a common element that is the development of a competitive advantage of those who are adopters against those who are not. However, from a social perspective, it is possible that other factors have positive or negative implications in the relationship, for example Social Influence or, ethical, moral, religious values, traditional beliefs, etc. Reinares-Lara, Olarte-Pascual, & Pelegrín-Borondo (2018) did not find a moderating relationship on ethical and moral factors on performance expectation. However, for this investigation a direct relationship will be determined. Zhou et al., (2010) found a direct relationship between technological adjustment activities and the expectation of performance towards the

intention to use a technology, Oliveira, Faria, Thomas, & Popovič (2014) also point out that the expectation of performance is a factor that explains that the consumer is to seek extra value on the use of a technology.

The diffusion theory of innovations indicates that some individuals tend to adopt an innovation before others. However, the concept of innovation has not been fully conceptualized, and its measurement is complicated due to its hypothetical nature. Still, marketing scholars often segment individuals into "innovators" and "non-innovators" (Agarwal & Prasad, 1998). The information generated by consumers is of great importance to companies for the development of new products. Despite this, the dynamics of the markets has given way to a new type of consumer, who is referred to as "active" in the academic literature. This new paradigm describes the consumer as innovative (Hippel, Ogawa, & Jong, 2011). Based on the theory, we assume the existence of a direct relationship between the degree of innovation and the intention to use a technology, so the relationship between the factors of innovation and gender of the consumer and their intention to use will be analysed. According to Rogers (1983, p. 242), innovatively refers to the degree to which an individual is relatively earlier in adopting new ideas than other members of a system.

3. METHODOLOGY AND HYPOTHESIS

For this study we analyse specific information of 152 youngster of the city of San Luis Potosí (Mexico). Most of them are undergraduate students. The data analysed were collected by a survey instrument (Pelegrín-Borondo & Arias-Oliva, 2017). The survey was designed to obtain information about several topics such as, intention to use, performance expectancy, effort expectancy, social influence, hedonic motivation, facilitating conditions, perceived risk, ethical awareness and innovativeness.

The items in the survey were measured in most of the cases using a Likert Scale from 0 strongly agree to 10 strongly disagree. The survey was developed online by the Google docs engine and was applied online (e.g. emailed and sent through social networks). The descriptive analysis of the data was carried out using the statistical software SPSS v.25. For the comparison of groups, the R statistical software, the RStudio interface and the PLSPM packages were used (Sanchez, 2013).

With the collected data and following the state of the art we will analyse the following hypothesis:

- H1.** The subjective norms have a significant influence in youngsters to use wearables or insideables.
- H2.** The performance expectancy has a significant influence in youngster to adopt wearables or insideables.
- H3.** The innovativeness of the consumer has a significant influence in youngster to use wearables or insideables.
- H4.** There are differences in the innovativeness degree between male and female adopting wearables or insideables.

4. RESULTS

For the first section of the survey we introduce some demographic data to know how our sample is distributed. We identified that most representative gender were females with the 55.9% of surveyed and the 44.1% were males. The gender balance of respondents is show in Table 1.

Table 1. Contingency table of age and gender.

| Gender | Age | | | Total |
|--------|-----------------|----------------|----------------|-----------------|
| | 18-24 | 25-30 | 30+ | |
| Female | 69 (57.0%) | 5 (41.7%) | 11 (57.9%) | 85 (55.9%) |
| Male | 52 (43.0%) | 7 (58.3%) | 8 (42.1%) | 67 (44.1%) |
| Total | 121 (100.0%) | 12 (100.0%) | 19 (100.0%) | 152 (100.0%) |

Source: self-elaboration-based survey data

According to the data analysis, the perception of surveyed youngsters about the adoption and use of technologies shown a high preference for wearables devices instead insideables. For example, the average of the intention to use (IU) of wearables is 7.73 and 7.46 and for insideables the average for both variables are 5.63 and 5.29. In Table 2, we can observe that the means for most of the variables applied (intention of use, performance expectancy (PE), effort expectancy (EE), social influence (SI), hedonic motivation (HM) and facilitating conditions (FC)) are greater in the wearables section than insideables section. Additionally, we can note that the variable perceived risk is the only one in where statistical mean are switched, it is probably a social factor influencing (negatively) in the perception of acceptance of insideable. Furthermore, in Table 2 we made a t-test for paired samples means between wearables and insideables, and we found statistical significance for all variables with a p-value<0.001, except in variables PE2 and PE4 with a p-value<0.1. It shows that the perception of wearables is strongly than insideables, in all variables.

Table 2. t-test paired samples IU-PE-EE-SI-HM-FC-PR.

| Variables | Wearables | | Insideables | | t-test (paired samples) |
|--|-----------|---------|-------------|---------|-------------------------|
| | mean | S.D. | mean | S.D. | Pr(T > t) |
| IU1. I intend to use wearables/insideables | 7.7303 | 2.26687 | 5.6382 | 3.07640 | 0.000 |
| IU2. I predict that I would use wearables/insideables | 7.4671 | 2.57064 | 5.2961 | 3.00956 | 0.000 |
| PE1. I believe wearables/insideables will be useful in my daily life | 7.5592 | 2.38298 | 6.2961 | 2.93605 | 0.000 |
| PE2. Using wearables/insideables will increase my chances of achieving things that are important to me | 6.3684 | 2.47821 | 6.2237 | 2.93460 | 0.510 |
| PE3. Using wearables/insideables will help me accomplish things more quickly | 7.5724 | 2.06068 | 6.6842 | 2.77506 | 0.000 |
| PE4. Using wearables/insideables will increase my productivity | 6.9605 | 2.33568 | 6.5921 | 2.88259 | 0.085 |
| EE1. Learning how to use wearables/insideables will be easy for me | 8.1645 | 2.05050 | 6.3289 | 2.81852 | 0.000 |
| EE2. My interaction with wearables/insideables will be clear and understandable | 7.7961 | 2.06304 | 6.1974 | 2.88646 | 0.000 |
| EE3. I will find wearables/insideables easy to use | 7.9671 | 2.20601 | 6.1842 | 2.84342 | 0.000 |
| EE4. It will be easy for me to become skillful at using wearables/insideables | 7.2039 | 2.29407 | 5.6250 | 2.84433 | 0.000 |

ADOPTING WEARABLES AND INSIDEABLES TECHNOLOGIES: WHAT IS THE MAIN FACTOR INFLUENCING IN MEXICAN YOUNGSTERS?

| | | | | | |
|--|--------|---------|--------|---------|-------|
| SI1. People who are important to me will think that I should use wearables/insideables | 5.1447 | 2.87120 | 4.3750 | 3.06402 | 0.002 |
| SI2. People who influence my behavior will think that I should use wearables/insideables | 5.4079 | 2.68761 | 4.4079 | 2.99968 | 0.000 |
| SI3. People whose opinions that I value will prefer that I use wearables/insideables | 5.1974 | 2.80973 | 4.3092 | 3.00382 | 0.000 |
| HM1. Using wearables/insideables will be fun | 7.9868 | 2.05548 | 6.3355 | 2.69398 | 0.000 |
| HM2. Using wearables/insideables will be enjoyable | 7.9145 | 2.03917 | 6.0132 | 2.87254 | 0.000 |
| HM3. Using wearables/insideables will be very entertaining | 7.9868 | 2.11268 | 6.3750 | 2.73997 | 0.000 |
| FC1. I will have the resources necessary to use wearables/insideables | 6.3224 | 2.38817 | 5.2500 | 2.82198 | 0.000 |
| FC2. I will have the knowledge necessary to use wearables/insideables | 7.5921 | 2.12633 | 5.7829 | 2.76189 | 0.000 |
| FC3. Wearables/insideables will be compatible with other technologies I use | 8.1974 | 1.89121 | 6.5855 | 2.62551 | 0.000 |
| FC4. I will be able to get help from others when I have difficulties using wearables/insideables | 8.0263 | 2.02941 | 6.4474 | 2.55221 | 0.000 |
| PR1. Using wearables/insideables is risky | 4.8355 | 3.03935 | 6.7632 | 2.49698 | 0.000 |
| PR2. There is too much uncertainty associated with using wearables/insideables | 5.9276 | 2.74309 | 7.4276 | 2.54913 | 0.000 |
| PR3. Compared to other technologies, wearables/insideables are riskier | 5.2632 | 2.71063 | 7.2039 | 2.50123 | 0.000 |
| Ho: mean(difference)= 0 Ha: mean(difference) ≠0 degrees of freedom =151 | | | | | |

Source: self-elaboration-based survey data

We analyse the means difference of variables for the ethical, morality, traditional and cultural opinions of surveyed. Table 3 summarize the results for a t-test for paired samples. As the Table 2, we can observe that respondents prefer wearables (higher mean) than insideables (lower mean). In this case, excluding EA8, we can reject the null hypothesis of equals means.

Table 3. t-test paired samples Ethical Awareness.

| Variables | Wearables | | Insideables | | t-test (paired samples) |
|--|-----------|--------|-------------|--------|-------------------------|
| | mean | S.D. | mean | S.D. | Pr(T > t) |
| EA1. Unethical / Ethical | 7.3882 | 2.3587 | 5.9803 | 2.6830 | 0.0000 |
| EA2. Unjust / Just | 7.4737 | 2.2492 | 6.2566 | 2.5540 | 0.0000 |
| EA3. Unfair / Fair | 7.3553 | 2.3000 | 5.6447 | 2.8177 | 0.0000 |
| EA4. Not morally right / Morally right | 7.3618 | 2.4752 | 5.9803 | 2.5436 | 0.0000 |
| EA5. Not acceptable to my family / Acceptable to my family | 7.5329 | 2.2900 | 5.7763 | 2.8054 | 0.0000 |
| EA6. Culturally unacceptable / Culturally acceptable | 7.5132 | 2.2345 | 5.5066 | 2.3303 | 0.0000 |
| EA7. Traditionally unacceptable / Traditionally acceptable | 6.5921 | 2.4423 | 5.0526 | 2.5366 | 0.0000 |
| EA8. Not self-promoting for me / Self-promoting for me | 6.6842 | 2.2856 | 6.1908 | 2.6388 | 0.0195 |
| EA9. Not personally satisfying for me / Personally satisfying for me | 7.5000 | 2.4522 | 6.2697 | 2.6091 | 0.0000 |

2. Cyborg: A Cross Cultural Observatory

| | | | | | |
|---|--------|--------|--------|--------|--------|
| EA10. Produces the least utility / Produces the greatest utility | 8.0132 | 2.2077 | 7.3026 | 2.5320 | 0.0003 |
| EA11. Minimizes benefits while maximizes harm / Maximizes benefits while minimizes harm | 7.4145 | 2.2091 | 6.4671 | 2.4681 | 0.0000 |
| EA12. Violates an unwritten contract / Does not violate an unwritten contract | 7.0526 | 2.6163 | 5.8947 | 2.5218 | 0.0000 |
| EA13. Violates an unspoken promise / Does not violate an unspoken promise | 7.2368 | 2.6488 | 6.0066 | 2.6432 | 0.0000 |
| Ho: mean(difference)= 0 Ha: mean(difference) ≠0 degrees of freedom =151 | | | | | |

Source: self-elaboration-based survey data

Table 4 shows the correlation matrix between the variables Intention of use (IU) and Table 5 shows the Performance Expectancy (PE) and Intention of use and Social Influence (SI) correlations. From the results, we can conclude that there is a positive and significant relationship between the IU and PE, and IU and SI, both for wearables and insideables. However, we observed a stronger correlation in these variables for insideables than wearables, which suggests that although the mean of wearables is greater than insideables for each variable (as seen in Table 2 and Table 3) SI and PE determinate in a greater way the use of the insideables.

Table 4. Correlation test IU-PE.

| | Wearables | | Insideables | |
|-----|-----------|--------|-------------|--------|
| | IU1 | IU2 | IU1 | IU2 |
| IU1 | 1 | .785** | 1 | .866** |
| IU2 | .785** | 1 | .866** | 1 |
| PE1 | .587** | .601** | .771** | .728** |
| PE2 | .455** | .534** | .791** | .736** |
| PE3 | .552** | .611** | .716** | .665** |
| PE4 | .486** | .551** | .669** | .645** |

** . La correlación es significativa en el nivel 0,01 (bilateral).

Source: self-elaboration-based survey data

Table 5. Correlation test IU-SI.

| | Wearables | | Insideables | |
|-----|-----------|--------|-------------|--------|
| | IU1 | IU2 | IU1 | IU2 |
| IU1 | 1 | .785** | 1 | .866** |
| IU2 | .785** | 1 | .866** | 1 |
| SI1 | .345** | .353** | .588** | .611** |
| SI2 | .404** | .391** | .563** | .609** |
| SI3 | .373** | .380** | .588** | .609** |

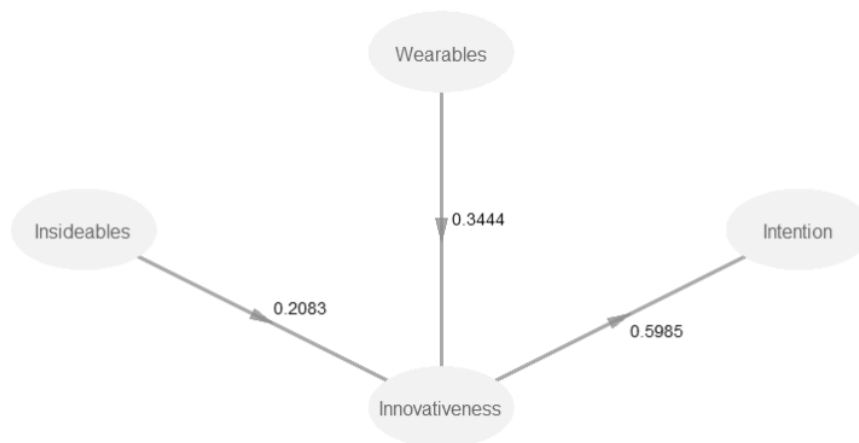
** . La correlación es significativa en el nivel 0,01 (bilateral).

Source: self-elaboration-based survey data

At the top section of this work, we proposed the hypothesis H3 and H4. Based on the state of the art, we assume that some ethical, cultural, and moral factors may have implications in the degree of

innovativeness of individuals. In this case, we developed a simple model based on Path Analysis theory, in which four factors are evaluated. Wearables, that contains the individuals' ethical and morality perceptions to use wearables. Similarity, the factor Insideable comprises the individuals' ethical and morality perceptions to use insideables. The third factor includes the degree of innovativeness of the individual, that means, she or he is more or less an innovative consumer of technologies, the last one covers some variables that determine the degree of intention to use a technology. Figure 1 shows the path results of the model. Even if the path analysis showed a small weight, but we can observe that there is a positive relation between wearables and insideables factors and innovativeness.

Figure 1. Global Inner model with path coefficients.



Source: self-elaboration-based survey data

To assess how relevant these results are we should examine the bootstrapped path coefficient.

Table 6. Bootstrapped path coefficients.

| Path | Original | Mean.Boot | Std.Error | perc.025 | perc.975 |
|------------------------------|----------|-----------|-----------|----------|----------|
| Wearables → Innovativeness | 0.3444 | 0.3465 | 0.0897 | 0.1581 | 0.4780 |
| Insideables → Innovativeness | 0.2083 | 0.2187 | 0.0817 | 0.0626 | 0.3612 |
| Innovativeness → Intention | 0.5985 | 0.6018 | 0.0566 | 0.4933 | 0.7057 |

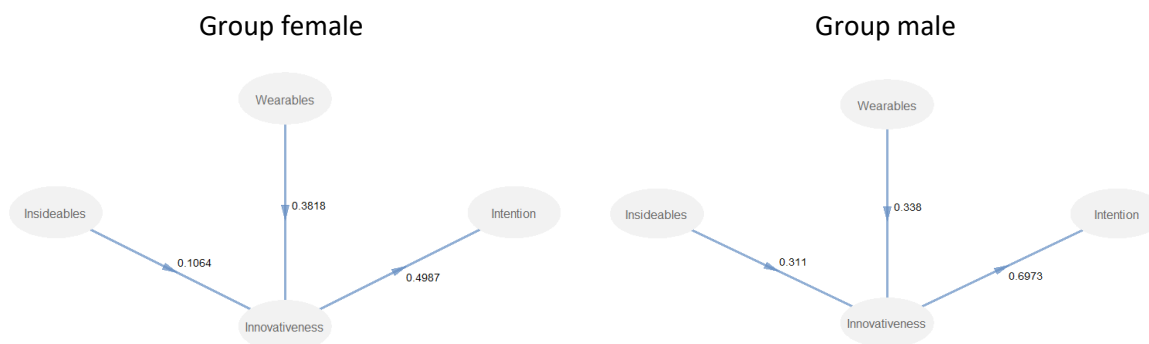
Source: self-elaboration based survey data

Table 6 summarize the Bootstrap analysis for the proposed model. It shows that all path coefficients are significantly different of zero. We can observe the path Insideables → Innovativeness shows a coefficient of 0.0626 in the lowest percentile, it could indicate a less importance in the relation of ethical and moral with the innovativeness degree and it may be due the less adoption of insideables by youngsters in comparison with wearables. In general, we can say from obtained results that youngsters' innovativeness has not that much to do with the ethical/moral of using wearables or insideables. The intention to use has an important influence in the path with the innovativeness degree.

In order to evaluate the proposed H5, we calculate a new PLS regression by grouping Female and Male. We aim to know is there are significant differences between gender and the degree of innovativeness

in youngsters. Sanchez (2013) points out that Path Models should be calculated separately as is shown in Figure 2.

Figure 2. Path Coefficients of Female and Male Students.



Source: self-elaboration-based survey data

Both of models shows different path coefficients as we expected due to the data collected. As in any model comparison, researchers must measure those differences detailly; that means, which is the real difference between models. There are two methods to comparing groups: the Bootstarp t-test and the Bootstrap permutation test. Matthews (2017) points out that the permutation tests is the most recommended due it has a better control of error type 1. The author suggests the use of 5000 iterations for this method. The Table 7 shows the results of the permutation analysis.

Table 7. Group comparison in PLS-PM for path coefficients.

| Path | Global | Group female | Group male | Diff.abs | p.value | Sig.05 |
|------------------------------|--------|--------------|------------|----------|---------|--------|
| Wearables → Innovativeness | 0.3444 | 0.3818 | 0.338 | 0.0438 | 0.8122 | No |
| Insideables → Innovativeness | 0.2083 | 0.1064 | 0.311 | 0.2046 | 0.2705 | No |
| Innovativeness → Intention | 0.5985 | 0.4987 | 0.6973 | 0.1985 | 0.0952 | No |

Based in centroid weighting scheme and 5000 iterations

Source: self-elaboration-based survey data

As we can see from the obtained results, none of the path coefficients between females and males are significantly different.

5. CONCLUSION

In this study we evaluate some cases of perceptions in youngsters regarding the adoption and use of technologies. The aim study was to know if the youngster social values, such as ethics, culture, moral, etc have significant influence on the perception to use wearables or insideables. Our results showed that youngsters are more likely to accept and use wearables (like electronic gadgets) than insideables (like electronic implants). The study also points out that there are some factors associated to the intention to use; such as, Social Influence, Performance Expectancy among others as we mentioned

before, the group study shows that there are no relation in the youngsters' innovativeness and the believes or social values, that means, as males as females are technology pioneers similarly.

We also pointed out that human being will seek to meet their needs and their wants. Commonly, technology addresses the need and the wants, but individuals normally wants all that is considered good, beneficial for them (Thomson, 1998) or whit a perceived value (Bustamante, 2015). In this study, was found that youngsters are more likely to accept and use Wearables, a possible circumstance of this fact is that technology addresses their needs towards wants more and not for a real perceived value. However, the market of gadgets is very wide and a study on specific gadget must be carried out.

One more finding in this study is the perception of using insideables is not very good, this can be due to ethical, moral, or religious reasons that today are concepts very ingrained in the country. An implication in business is that the companies developing these devices should define their market segment based on these findings and make a good marketing strategy using social influence to be able to cover a wider market.

Finally, an important finding concerns the perception of utility of the devices (implants or not). In the study it can be observed that the assertions of the respondents suggest that they would be willing to use technological implants only if they find a perceived utility. This finding has an important implication, if on the one hand the social influence determines the use of the wearables for the use of technological implants is the performance. Therefore, the market must be guided more by the sense of usefulness than fashionable.

REFERENCES

- Agarwal, R., & Prasad, J. (1998). A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Information Systems Research*, 9(2), 204–215.
- Aguilar Jimenez, A. S., Gamboa Pico, L. P., & Rueda Díaz, V. C. (2011). Adopción de tecnologías de información y comunicaciones en pequeñas y medianas empresas manufactureras en Bucaramanga y su área metropolitana. Una aproximación al sector de la confección. *Iteckne*, 9(1), 42–50. <https://doi.org/10.15332/iteckne.v9i1.59>
- Audretsch, D., & Callejón Forniellas, M. (2007). La política industrial actual: conocimiento e innovación empresarial. *Economía industrial*, (363), 33–46.
- Bustamante, J. C. (2015). Use of mediating and moderating variables in explaining consumer loyalty in service environments. *Estudios Gerenciales*, 31, 299–309. <https://doi.org/10.1016/j.estger.2015.05.002>
- Cabrero Mendoza, E. (2017). ¿Dónde está México en ciencia y tecnología? Recuperado de <http://www.jornada.unam.mx/2017/10/02/opinion/030a1pol>
- Camhaji, E. (2017). La ciencia, la oportunidad que México ha dejado pasar. Recuperado el 6 de enero de 2018, de https://elpais.com/elpais/2017/12/01/ciencia/1512157927_534452.html
- Castro-Jaramillo, Á. M., Guevara-Valencia, S., & Jaramillo-Rojas, C. A. (2016). Análisis sociojurídico del surgimiento y expansión de las redes sociales en internet y la intimidad en Colombia. *Revista Criterio Libre Jurídico*, 13(2), 67–78. <https://doi.org/10.18041/crilibjur.2016.v13n2.26201>. 67
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User Acceptance of Computer Technology: A Comparison of Two Theoretical Models. *Management Science*, 35(8), 982–1003. <https://doi.org/10.1287/mnsc.35.8.982>

- Davis, Fred D. (1989). Perceived Usefulness , Perceived Ease of Use , and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319–340.
- Escamilla, O. (2019). ¿Cómo se encuentra el mercado de los Wearables? Recuperado de <https://www.merca20.com/mercado-de-los-wearables/>
- Foerster, A., Cantu, L. R., Wildman, R., & Tuck, C. (2019). Current Market for Biomedical Implants. En *Polymer-Based Additive Manufacturing* (pp. 97–119). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-24532-0_5
- Fresneda Lorente, C. (2019). El gasto en tecnología de la información crecerá más de un 3 % hasta 2020. Recuperado de <https://es.weforum.org/agenda/2017/03/el-gasto-en-tecnologia-de-la-informacion-crecera-mas-de-un-3-hasta-2020>
- Fröbel, F., Avramidis, E., & Joost, G. (2019). Workshop on Wearables and Machine Learning: Applications of Artificial Intelligence , Approaches on Textile Technology. En *Cooperation International Conference in HCI and UX* (pp. 177–181).
- Garibay, J. (2018). ¿Será 2018 un buen año para los Wearables? Recuperado el 5 de enero de 2018, de <https://www.merca20.com/sera-el-2018-un-buen-ano-para-los-wearables/>
- Gauttier, S. (2019). ‘I’ve got you under my skin’ – The role of ethical consideration in the (non-) acceptance of insideables in the workplace. *Technology in Society*, 56(August 2018), 93–108. <https://doi.org/10.1016/j.techsoc.2018.09.008>
- Haeberle, H. S., Helm, J. M., Navarro, S. M., Karnuta, J. M., Schaffer, J. L., Callaghan, J. J., ... Ramkumar, P. N. (2019). Artificial Intelligence and Machine Learning in Lower Extremity Arthroplasty: A Review. *Journal of Arthroplasty*, 3–5. <https://doi.org/10.1016/j.arth.2019.05.055>
- Hippel, E. Von, Ogawa, S., & Jong, J. P. J. De. (2011). The Age of the The Age of the Consumer. *MIT Sloan Management Review*, 53(1), 0–16.
- Interactive Advertising Bureau México. (2019). *Estudio de Consumos de Medios y Dispositivos entre internautas Mexicanos*.
- Koo, C., & Chung, N. (2014). Examining the eco-technological knowledge of Smart Green IT adoption behavior: A self-determination perspective. *Technological Forecasting and Social Change*, 88, 140–155. <https://doi.org/10.1016/j.techfore.2014.06.025>
- Lee, M.-C. (2009). Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications*, 8(3), 130–141. <https://doi.org/10.1016/j.elerap.2008.11.006>
- Lee, Y.-H., Hsieh, Y.-C., & Hsu, C.-N. (2011). Adding Innovation Diffusion Theory to the Technology Acceptance Model: Supporting Employees’ Intentions to use E-Learning Systems. *Educational Technology & Society*, 14(4), 124–137.
- Manjarrez Nevárez, L. A., Terrazas Bandala, L. P., Zermeño Ortega, M. R., De la Vega Cobos, C., Zapata Chávez, E., Torres Rojo, F. I., ... Lerma Gutiérrez, R. (2017). Biomateriales como Implantes en el Cuerpo Humano. Recuperado el 8 de enero de 2018, de <http://beta.uach.mx/articulo/2017/10/20/biomateriales-como-implantes-en-el-cuerpo-humano/>
- Matthews, L. (2017). Applying Multigroup Analysis in PLS-SEM: A Step-by-Step Process. En *Partial Least Squares Path Modeling* (pp. 219–243). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-64069-3_10

- McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa ... examine the variables influencing the use of artificial intelligent in-home voice assistants. *Computers in Human Behavior*, 99(May), 28–37. <https://doi.org/10.1016/j.chb.2019.05.009>
- Murata, K., Arias-Oliva, M., & Pelegrín-Borondo, J. (2019). Cross-cultural study about cyborg market acceptance: Japan versus Spain. *European Research on Management and Business Economics*, 25(3), 129–137. <https://doi.org/10.1016/j.iiedeen.2019.07.003>
- Neuman, G. (2017). Invierte en tecnología y deduce hasta un 94 %. ¡ Deducir o no deducir , esa es la...! Recuperado el 6 de enero de 2018, de <https://www.pulsopyme.com/inviertir-tecnologia-deduce/>
- OECD. (2017). *OECD Digital Economy Outlook 2017*. Paris: OECD Publishing. <https://doi.org/10.1787/9789264276284-en>
- Oliveira, T., Faria, M., Thomas, M. A., & Popovič, A. (2014). Extending the understanding of mobile banking adoption: When UTAUT meets TTF and ITM. *International Journal of Information Management*, 34(5), 689–703. <https://doi.org/10.1016/j.ijinfomgt.2014.06.004>
- Pelaez, A., Chen, C. W., & Chen, Y. X. (2019). Effects of Perceived Risk on Intention to Purchase: A Meta-Analysis. *Journal of Computer Information Systems*, 59(1), 73–84. <https://doi.org/10.1080/08874417.2017.1300514>
- Pelegrín-Borondo, J., & Arias-Oliva, M. (2017). Cyborg Ethics : wearables to insideables Project working fundamentals : Project basic description (track description) Team members, 1–4.
- Pelegrín-Borondo, J., Arias-Oliva, M., Murata, K., & Souto-Romero, M. (2018). Does Ethical Judgment Determine the Decision to Become a Cyborg?: Influence of Ethical Judgment on the Cyborg Market. *Journal of Business Ethics*, 0(0), 0. <https://doi.org/10.1007/s10551-018-3970-7>
- Porter, M. (2008). Las cinco fuerzas competitivas que le dan forma a la estrategia. *Harvard Business Review*, 86(1), 58–77.
- Reinares-Lara, E., Olarte-Pascual, C., & Pelegrín-Borondo, J. (2018). Do you want to be a cyborg? The moderating effect of ethics on neural implant acceptance. *Computers in Human Behavior*, 85, 43–53. <https://doi.org/10.1016/j.chb.2018.03.032>
- Rios Montanez, A. M. (2020). Mexico: aesthetic procedures 2014-2018. Recuperado de <https://www.statista.com/statistics/1088930/mexico-cosmetic-aesthetic-procedures/>
- Rogers, E. M. (1983). *Diffusion of Innovations* (3rd.). New York: The Free Press. A division of Collier Macmillan Publishing Co., Inc.
- Sanchez, G. (2013). *PLS Path Modeling with R. R Package Notes*. Berkeley: Trowchez Editions. <https://doi.org/citeulike-article-id:13341888>
- Shin, D. H. (2010). Modeling the interaction of users and mobile payment system: Conceptual framework. *International Journal of Human-Computer Interaction*, 26(10), 917–940. <https://doi.org/10.1080/10447318.2010.502098>
- Sugarhood, P., Wherton, J., Procter, R., Hinder, S., & Greenhalgh, T. (2014). Technology as system innovation: a key informant interview study of the application of the diffusion of innovation model to telecare. *Disability and Rehabilitation: Assistive Technology*, 9(1), 79–87. <https://doi.org/10.3109/17483107.2013.823573>
- Thomson, G. (1998). Deseos y necesidades. *Ideas y Valores*, Agosto(107), 43–55.

- Velázquez Fernández, H. (2009). Transhumanismo, libertad e identidad humana. *Thémata. Revista de filosofía*, 41, 577–590.
- Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences*, 39(2), 273–315. <https://doi.org/10.1111/j.1540-5915.2008.00192.x>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425–478.
- Wei, J. (2014). How wearables intersect with the cloud and the internet of things: Considerations for the developers of wearables. *IEEE Consumer Electronics Magazine*, 3(3), 53–56. <https://doi.org/10.1109/MCE.2014.2317895>
- Zhou, T., Lu, Y., & Wang, B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior*, 26(4), 760–767. <https://doi.org/10.1016/j.chb.2010.01.013>