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# UNDERSTANDING THE IMPACT OF SOCIAL INFLUENCE ON ENGAGEMENT IN IOT SPORTS TECHNOLOGY: A MEDIATION ANALYSIS

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## ABSTRACT

The Internet of Things (IoT) is a major revolution that is transforming the world of sports and enabling athletes to improve their physical performance. The use of IoT devices for sports is based primarily on the sharing of athletes' achievements online and the interaction between them, which allows them to motivate and encourage each other to improve their physical performance. Our research analyzes the influence of family and friends (INF_SOC) on engagement (ENGAG) in the ongoing and long-term use of these IoT devices and studies the mediating effect of perceived control (CP), perceived provider credibility (CRD), and trust (CONF) in this relationship. The population is the athletes who use IoT to measure their performance. Convenience sampling was deployed to collect the data using a questionnaire. 313 respondents participated in this study. To analyze our theoretical model, we used the method of partial least squares under SmartPls. The results confirmed all the theoretical hypotheses introduced and validated the mediating effects. They allowed us to generate interesting recommendations for IoT providers and users to reinforce engagement in the use of the Internet of Things for sports.

***Keywords:*** Social influence; User engagement; User Trust; Sport; Internet of things.

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## 1. INTRODUCTION

The Internet of Things is a rapidly emerging technology that is increasingly integrated into our daily lives. The number of IoT devices has tripled between 2010 and 2015, indicating significant growth (Greenough & Camhi, 2015). Given this rapid development, some researchers believe that this technology will revolutionize the world (Fantana et al., 2013) and could be the foundation of the future ICT market (Boswarthick et al., 2012). IoT devices offer several applications, benefiting

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areas such as connected cities, waste management, security, health, logistics, and sports (Höller et al., 2014). These devices leverage the expansion of Internet infrastructure (Wifi, 4G) and RFID chips (Palattella et al., 2013).

In France, sports have played a vital role in societal development. It has made it possible to transmit important values such as competitiveness and meritocracy. Several factors have contributed to the promotion of sports activities. Media and the latest communication technologies have a vital role to play. They facilitate the global dissemination of sports events and encourage sports practice. Additionally, they enable the tracking of famous athletes, making them inspirational figures for aspiring young individuals aiming to achieve similar levels of success. Furthermore, other social factors are also present such as the abundance of free time in modern society and the increased practice of the elderly population who desire to prevent illnesses and extend their life expectancy. Lastly, the rise in female practitioners is another noteworthy factor. Between 2009 and 2015, the proportion of French women practicing sports has risen from 40% to 45%, compared with 50% for men in 2015 (Gleizes & Pénicaud, 2017). This surge in sports practice has also led to an increased interest in sports psychology and the adoption of new technologies to enhance sports performance.

A study conducted by the Institute of Research (IDATE)1 highlights several challenges facing the success of IoT in sports, such as high prices, short battery life, and privacy issues. According to the same study, these challenges have contributed to a significant abandonment rate of around 50% within the first eighteen months after purchase. To tackle this problem, this research explores the factors that strengthen the engagement of sports users to retain them. Our theoretical model was influenced by the relationship between social influence and user trust and engagement. While the adoption of IoT in sports has been driven by novelty, the aspects of user engagement and long-term usage in the IoT context require further exploration, both theoretically and empirically. Given this gap, the main objective of the present research is to analyze the social influence on user engagement in the context of IoT for sports. It aims to address the issue of high abandonment rates of IoT devices in sports and focuses on factors that can improve user engagement. This purpose leads to the following question:

**How does social influence enhance trust and engagement in the use of IoT devices for sports?**

This research aims to explain several determinants of user engagement. To this end, it proposes a model that combines variables that have been studied in previous research (social influence, perceived control, and user trust) with others that have, thus far, received little research attention (perceived provider credibility), with user engagement playing a key role. Our theoretical model provides interesting avenues of analysis and explains how the social environment can lead to user engagement beyond the act of purchase. It emphasized the central role of trust as a determining factor in user engagement. This involves addressing the two aspects of this variable put forward by Hong and Cho (2011), namely trust in IoT devices through perceived control and trust in IoT providers through perceived credibility. We expect that the social influence and the user's perception of control and provider credibility will reinforce perceived usefulness and reduce the perception of risks related to use such as security and privacy issues. They will therefore enhance trust in IoT devices for sports, which in turn can lead to user engagement.

[1] https://fr.idate.org/les-ventes-dobjets-connectes-lies-au-sport-wearables-accessoires-sportifs-vetements-de-sport-devraient-atteindre-253-millions-dunites-dici-2021/ accessed on 25 June 2023

A non-probability sample was collected from 313 French athletes. The collected data were then treated by using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method. The paper begins with a concise review of IoT adoption literature, discussing several variables that influence user engagement in IoT for sports and proposing conceptual hypotheses. Subsequently, the research model is presented. The research methodology is detailed in section 3, followed by the presentation of results in section 4. The implications and discussion of the findings are provided in section 5, and the paper concludes with section 6, which addresses research limitations and potential future directions.

## 2. LITERATURE REVIEW

This section reviews the current literature about the IoT for sports. We analyzed several variables such as social influence, user trust, and perceived control that reinforce user engagement. We proposed relevant hypotheses and presented our theoretical model at the end of this section.

### *2.1. IoT for sport*

The market for IoT for sports is up-and-coming. The Institute of Research (IDATE) explains that the connected sports market will continue its growth in the coming years. According to Ray (2015), IoT devices for sports include sensors, microcontrollers, and smartphone apps that enable athletes, coaches, and medical teams to measure sporting performance while remaining interconnected and forming a cohesive network. In France, the field is proliferating, with most of the population interested in solutions that help maintain good health and track physical performance. The role of social networks in the success of this technology is also important. They allow athletes to share their achievements and performances and motivate each other.

IoT devices for sports occupy the daily life of athletes. The integration of IoT technology into sports applications enhances athlete performance in various situations, be it during training sessions or actual competitions (Ahmad, Adib, & Txi, 2022). When practicing sports, this technology tracks and provides information that helps the user to improve his practice in a precise and personalized way. It also helps to anticipate the risk of injury and the need for rest. This makes performance measurement in sports accessible and within reach of everyone. IoT devices for sports encourage the practice of sports and help fight against certain diseases. Nearly 93% of doctors consider that this technology helps prevent obesity-related diseases such as diabetes, hypertension, and cardiovascular diseases. According to the same study, half of the French people of different age categories consider that IoT devices facilitate and improve health management (Garnier, 2016).

### *2.2. Influence of social environment*

The social environment determines the decision to engage in the use of technology. Its impact has been extensively analyzed in the context of new technology adoption. Chong et al. (2012) found that social environment (family and friends) influences the individual's intention to adopt new technologies. They explain that the person may use technology just to conform to community values. This idea is shared by Fishbein and Ajzen (2011) who argued that the adoption decision is influenced by reward, punishment, and other factors such as willingness to conform to the community's vision. It is also validated by Muniz and Schau (2005) in the context of brand

communities. Another important and influential element is the prestige aspect which reflects the individual's willingness to adopt technology to improve his or her social status (Plouffe, Hulland, & Vandenbosch, 2001).

Durand-Mégret and Vanheems (2019), in their work on the reinvention of family relationships, focused on the major role of adolescents using new technologies in exchanges with parents. They argue that new digital technologies offer users the opportunity to stay connected with their families. For Chaumon & Ciobanu (2009), new technologies such as cell phones reinforce social support between family members. They add that the family intervenes in the decision-making process of the purchase and use of these devices.

The social entourage plays an important role in reinforcing a person's positive perception of new technologies. Individuals trust the opinions of their communities rather than formal marketing sources such as advertising (Van Der Merwe & Van Heerden, 2009). This makes the social circle very influential in decision-making (Hsu & Lu, 2004). Honneth (2013) argues that social esteem allows the individual to have a positive view of their personal qualities and abilities. Therefore, this factor is based on ethical and cultural reference variables that govern society. This feeling favors the perception of control and mastery during use. It enhances the individual's trust in themselves and in new technologies, which strengthens engagement in the use of IoT devices for sports. According to Palau-Saumell et al. (2019), the social influence reinforces the use behavior. Regarding users' continued usage intention, social influence plays a crucial role (Gao et al., 2015; Yuan et al., 2016; Chopdar & Sivakumar, 2019; Marinković et al., 2020). From the above, we advance the following hypotheses:

**H1a:** The influence of the social environment reinforces perceived provider credibility.
**H1b:** The influence of the social environment reinforces user trust.
**H1c:** The influence of the social environment positively influences perceived control.

### *2.3. Perceived provider credibility*

Credibility is a subjective perception of a supplier's image, competence, and reputation formed based on previous experience (Lin et al., 2016). For Erdem and Swait (2004), perceived credibility is the belief that a partner is trustworthy and possesses the necessary expertise and competence to conduct transactions. This provider's competence depends on his knowledge, qualities, intelligence, skills, and experience. These elements enable him to control and master the situation so that the exchange takes place without incident (Samhale & Ladwein, 2019).

Wang et al. (2003) characterize perceived credibility as the extent to which a potential user believes a service will be free from security and privacy threats. In the same context, Luarn and Lin (2005) have estimated that the lack of perceived credibility raises concerns among consumers that their personal information may be transferred to unauthorized parties without their knowledge.

Previous research has indicated that perceived credibility significantly and positively influences customers' behavioral intention (Yuen et al., 2010; Tarhini et al., 2016). Some researchers have found that the absence of perceived credibility and trust has been identified as key reasons for people's resistance to adopting new technologies (Brown et al., 2003; Daniel & Jonathan, 2013). According to Tarhini et al. (2016), the integration of perceived credibility into theoretical models

of acceptance and use of technologies provides a better prediction of customers' behavioral intentions. To conclude, Soulard (2015) has argued that a credible source is more persuasive. Therefore, we formulate the following hypotheses:

**H2a:** Provider credibility positively influences user trust.
**H2b:** Provider credibility reinforces user engagement.

### *2.4. Perceived control*

Perceived control reflects the individual perception of how easy or difficult it is to act. This feeling is based on previous experiences and the perception of obstacles to be overcome and abilities to control the situation (Delouvée, 2015; Hidoussi et al., 2016). The individual with a strong sense of control is less vulnerable to stress. He adapts quickly to changes and benefits from a balance that allows him to control the means of success. This strengthens his engagement toward unusual situations (Palazzolo & Arnaud, 2015), as in our case of using IoT devices for sports.

The perception of control promotes the intention to use an information system (Hidoussi et al., 2016). It facilitates the use of computer applications (Link et al., 2006). In sports, perceived control is strongly present and acts on athlete behavior. It is an important motivation that drives the individual to use new technologies to improve their performance, such as the case of IoT devices that offer a clear vision of personal capabilities and recommendations to be able to develop them.

The favorable perception of control facilitates the person's adaptation to unusual situations. It promotes the acceptance of new challenges and the adoption of new technologies. Self-determination theory explains that human beings always seek to control their environment (Deci & Ryan, 2000; Sheldon et al., 2001). IoT devices for sports give users a clear vision of their performance and the best way to develop them. They reinforce the perception of control. This perceived control plays, therefore, a key role in enhancing engagement in the use of IoT devices for sports. From the above, we advance the following hypotheses:

**H3a:** Perceived control positively influences user trust.
**H3b:** Perceived control reinforces user engagement.

### *2.5. Trust in the use of IoT for sport*

According to Jang, Kim, and Lee (2016), trust refers to an individual's trust in an information system. It plays a vital role in sustaining long-term relationships and mitigating the risks associated with exchanges (Hikkerova et al., 2015). Trust holds significant importance in establishing and nurturing relationships (Karale, 2021). He explains that without trust, relationships are at risk of failure or breakdown. The Internet is often associated with notions of 'trust' or being 'trustworthy'. As awareness grows among the public, people are becoming more cognizant of potential drawbacks and negative aspects of new technologies in general. This lack of trust leads individuals to be cautious about their data and to take measures to minimize or restrict their exposure to the Internet (Karale, 2021).

In the online context, Li and Yeh (2010) have confirmed that a secure website reinforces trust and stimulates usage intention. In the same context, trust promotes this intention through the

establishment of a long-term relationship between Internet users and online service providers (Anis & Azza, 2005). It helps to minimize the perceived costs and promotes the adoption of new technologies (Balaji & Roy, 2017). IoT devices have become increasingly integrated into our daily lives. According to Karale (2021), Trust plays a pivotal role in the world of IoT. For users to wholeheartedly embrace IoT and smart devices, they must first ensure the reliability and trustworthiness of these components. This entails having trust that their data is securely protected and that they can believe in the devices' capabilities (Karale, 2021).

Trust plays a pivotal role in fostering long-term relationships, involving two or more parties. This concept holds exceptional importance in comprehending and nurturing enduring relationships (Morgan & Hunt, 1994; Martínez-López et al., 2017). It promotes user engagement (Anis & Azza, 2005). In the same sense, Pansari and Kumar (2017) argued that the user will be more engaged with a company when their trust relationship is satisfying and emotional. Thus, engagement occurs, in their view, only after trust is established. This finding is shared by other researchers such as Frisou (2000) and Chaudhuri and Holbrook (2001) who have proven the positive link between trust and engagement. From the above, we consider trust as a determinant of user engagement and propose the following hypothesis:

**H4:** Trust in IoT for sport reinforces engagement in the use of this technology.

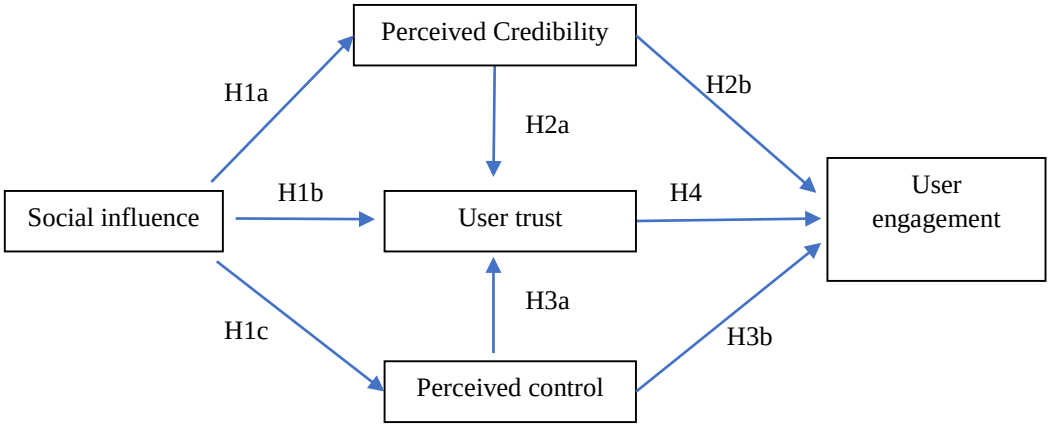
### *2.6. User engagement*

Marketing has undergone a major revolution from a traditional vision that focuses mainly on attracting users to a new one that puts much more effort into building user loyalty. Hence, manufacturers embracing a digital servitization strategy will likely face significant shifts in critical resources. They must undergo a transition not only from product-centric to user-centric business models but also progress toward more advanced data-centric business models (Cenamor et al., 2017; Kohtamäki et al., 2019; Tian et al., 2021). This shift has allowed for the development of user management concepts such as trust and engagement.

Researchers concur that user engagement is a psychological state characterized by regular interactions with the central object, surpassing the transactional motive of a mere purchase (Thakur, 2018). Dessart et al. (2015), analyzed three major elements of engagement namely, affective, cognitive, and behavioral, and determine several dimensions such as enthusiasm which refers to the consumer's intrinsic motivation, and the pleasure which results from the use and interaction with the brand. These first two elements make up the affective dimension. The cognitive dimension encompasses several elements linked to customer knowledge and concentration, such as attention and immersion, and finally, the behavioral dimension, which refers to the actions of sharing and understanding brand-related content and information.

For Morgan and Hunt (1994), engagement is meaningful in the long term, it is reflected in the person's intention and efforts to maintain the relationship over time. User engagement reflects their behavior toward the brand or company beyond the act of purchase (Doorn et al., 2010). According to Brodie et al. (2011), it is a user's psychological state derived from his experiences that occur through the interactivity with the object and reflects his willingness to invest his resources (time, energy, money) toward the brand beyond the first purchase (Keller, 2013; Islam & Rahman, 2016).

**Figure 1:** Framework Model of user engagement determinants.




## 3. RESEARCH METHODOLOGY

### *3.1. Measuring tools*

Regarding measurement scales, we have adopted Gao and Bai's (2014) scale used in the IoT context to analyze the influence of the social environment and perceived control. To measure the provider perceived credibility, we used the scale developed by (Samer, 2004). Next, we adapted the measurement scale of Gao et al. (2011) for user trust. Finally, user engagement was measured using the scale established by Islam and Rahman (2016). We asked respondents to report their agreement on a Likert scale with five modalities ranging from disagreement (1) to complete agreement (5). Our measurement scale was adapted to our research context and the French culture. To verify the reliability of the measurement scales, we discussed the items with several researchers who specialized in marketing and master the English language. Then, we analyzed our scale with a test sample. Subsequently, the selected items were validated using a test sample to ensure their reliability. A summary of the online survey stages is provided below in Table 1.

**Table 1:** Summary of the online survey stages.

| Periods | Stages of the Survey |
|---|---|
| September-October 2022 | Development of the research questionnaire (initial version) |
| November 2022 | Testing the initial version of our study questionnaire (sample of 104 responses) |
| December 2022 | Development of the research questionnaire (final version) |
| February 2023 | 313 responses retained (only users of the IoT devices for sport) |

### *3.2. Questionnaire administration*

Based on the context of the study and available resources, we chose to disseminate our questionnaire online. This method of online administration is becoming increasingly popular (Gavard-Perret et al., 2012) because it facilitates the contact of many respondents and guarantees their anonymity. The collection of responses to our questionnaire was done in six months using sports groups (swimming and running) on Facebook while targeting those who use IoT for sport. We began our questionnaire with an introduction that explained the Internet of Things for sports to all respondents.

### *3.3. Statistical Analysis Method*

To analyze our theoretical model, we chose the second-order structural equation method with the least partial squares method based on the analysis of variance and optimization of the explanatory power of manifest variables (Fernandes, 2012). This method is suitable for complex models with multidimensional latent variables and does not require a large sample size or data normality (Richter et al., 2016). It is perfectly suited for an online collection of responses with the different biases that this process can present. Our research sample is 313 responses. It is almost equally divided between women (43%) and men (57%), mostly executives or with intermediate professions (50%) and aged (78%) between 25 and 54 years old. The table below explains the characteristics of our study sample. (Table 2)

**Table 2:** Characteristics of the study sample.

| | | **Nb** | **(%)** |
|---|---|---|---|
| **Gendre** | Men | 179 | 57% |
| | Women | 134 | 43% |
| | Total | 313 | 100% |
| **Professional category** | Farmers, craftsmen, traders, entrepreneurs | 19 | 6% |
| | Executives and Intermediaries' professions | 155 | 50% |
| | Employees, workers | 76 | 24% |
| | Inactive | 63 | 20% |
| | Total | 313 | 100% |
| **Age** | Less than 25 years | 11 | 4% |
| | 25–39 years | 111 | 35% |
| | 40–54 years | 136 | 43% |
| | 55 years and more | 55 | 18% |
| | Total | 313 | 100% |

### *3.4. Reliability of Variables*

According to the data in Table 3 below, our theoretical model is validated with all loadings above 0.5 (Evrard et al., 2009). Then, the level of internal consistency is high with the composite reliability values and Cronbach's Alpha exceeding 0.7 (Fornell & Larcker, 1981). Finally, the average variance extracted (AVE) of the model is confirmed, with all values above 0.5 (Chin, 1998; Fornell & Larcker, 1981). All these findings allow us to confirm the convergent validity of our model.

**Table 3:** Reliability analysis of variables.

| Variables | Scales | Loadings | Alpha Cronbach | AVE | Composite reliability | R Square |
|---|---|---|---|---|---|---|
| Social Influence (INF_SOC) | INF_SOC 1 | 0.833 | 0.855 | 0.776 | 0.858 | |
| | INF_SOC 2 | 0.904 | | | | |
| | INF_SOC 3 | 0.904 | | | | |
| Perceived control (CP) | CP 1 | 0.705 | 0.751 | 0.674 | 0.757 | 0.018 |
| | CP 2 | 0.869 | | | | |
| | CP 3 | 0.878 | | | | |
| User trust (CONF) | CONF 1 | 0.710 | 0.885 | 0.588 | 0.906 | 0.146 |
| | CONF 2 | 0.678 | | | | |
| | CONF 3 | 0.775 | | | | |
| | CONF 4 | 0.800 | | | | |
| | CONF 5 | 0.827 | | | | |
| | CONF 6 | 0.804 | | | | |
| | CONF 7 | 0.761 | | | | |
| Perceived provider credibility | CRD 1 | 0.786 | 0.862 | 0.641 | 0.876 | 0.066 |
| | CRD 2 | 0.813 | | | | |
| | CRD 3 | 0.805 | | | | |
| | CRD 4 | 0.789 | | | | |
| | CRD 5 | 0.811 | | | | |
| User engagement (ENGAG) | ENGAG 1 | 0.876 | 0.927 | 0.775 | 0.939 | 0.183 |
| | ENGAG 2 | 0.907 | | | | |
| | ENGAG 3 | 0.940 | | | | |
| | ENGAG 4 | 0.786 | | | | |
| | ENGAG 5 | 0.885 | | | | |

### *3.5. Discriminant validity*

Table 4 below shows the correlation values between the different variables and the diagonal values of the square root of AVE. According to the results, the discriminant validity is confirmed because the square root of AVE for each variable is greater than the variation shared with the other variables in the model (Bagozzi & Yi, 2012).

**Table 4:** The square root of the AVE and correlation with other variables.

| | CONF | CP | CRD | INF_SOC | ENGAG |
|---|---|---|---|---|---|
| CONF | **0.767** | | | | |
| CP | 0.300 | **0.821** | | | |
| CRD | 0.285 | 0.394 | **0.801** | | |
| INF_SOC | 0.260 | 0.401 | 0.208 | **0.880** | |
| ENGAG | 0.228 | 0.135 | 0.257 | 0.335 | **0.881** |

## 4. FINDINGS

### *4.1. Structural model analysis*

Based on the results of our study, the research model is significant as the main variable namely engagement in the use of IoT for sport is explained by the rest of the variables with an $R^2$ value=18% above the minimum threshold of 13% (Wetzels et al., 2009).

### *4.2. Verification of theoretical hypothesis*

To test the theoretical hypothesis, we used the bootstrap analysis method on SmartPls (n= 313 and 5000 iterations). We find that all hypotheses are validated, with t-statistic values above 1.96 except the relationship between perceived credibility and user engagement (Hair et al., 2011). The results are presented in Table 5.

**Table 5:** Testing of theoretical hypotheses.

| Hypothesis | T statistic | P value | Verification |
|---|---|---|---|
| CONF -> ENGAG | 2.218 | 0.027 | Validated |
| CP -> CONF | 3.680 | 0.000 | Validated |
| CP -> ENGAG | 6.128 | 0.000 | Validated |
| CRD -> CONF | 2.514 | 0.012 | Validated |
| CRD -> ENGAG | 0.430 | 0.667 | Not validated |
| INF_SOC -> CONF | 2.599 | 0.009 | Validated |
| INF_SOC -> CP | 2.261 | 0.024 | Validated |
| INF_SOC -> CRD | 4.931 | 0.000 | Validated |

### *4.3. Validation of the mediating effect*

In this section, we will analyze several mediation relationships present in our theoretical model. On the one hand, we test the mediating roles of perceived control and perceived provider credibility in the relationship between social influence and user trust. On the other hand, we evaluate the mediating effect of user trust in the relationship between the impact of social environment and engagement in the use of IoT for sport.

After the execution of the Bootstrap technique, we evaluate the relationship between social influence and user trust which is significant in our case with a value of $p= 0.009<0.05$ (Hayes, 2017).

Next, we proceed to calculate the confidence interval for the relationship between social influence and user trust through perceived provider credibility. Both bounds of this interval are greater than zero, so perceived provider credibility plays a mediating role in this relationship (Hayes, 2017). The results are presented in Table 6.

**Table 6:** The mediating effect of perceived provider credibility.

| | Original sample (O) | Sample mean (M) | 2.5% | 97.5% |
|---|---|---|---|---|
| Perceived provider credibility | 0.041 | 0.042 | 0.009 | 0.080 |

Then, we proceed to calculate the confidence interval for the relationship between social influence and user trust with perceived control as a mediating variable. Both bounds of this interval are greater than zero, so perceived control plays a mediating role in this relationship (Hayes, 2017). The results are presented in Table 7.

**Table 7:** The mediating effect of perceived control.

| | Original sample (O) | Sample mean (M) | 2.5% | 97.5% |
|---|---|---|---|---|
| Perceived control | 0.029 | 0.031 | 0.004 | 0.066 |

Finally, we analyze the relationship between social influence and engagement in the use of IoT for sports through user trust which is significant with a value of $p= 0.010<0.05$ (Hayes, 2017). The confidence interval for the mediating role of user trust in the relationship between social influence and user engagement. We find that both bounds of this interval are greater than zero, so user trust plays a mediating role in this relationship (Hayes, 2017). The results are presented in Table 8.

**Table 8:** The mediating effect of trust in IoT.

| | Effect | Boot SE | Boot LLCI | Boot ULCI |
|---|---|---|---|---|
| User trust | 0.023 | 0.024 | 0.000 | 0.062 |

## 5. DISCUSSION AND IMPLICATIONS

### *5.1. Discussion of results*

The present research has proven the impact of the social environment (family and friends) on athlete behaviors. It also confirms that social context influences users' trust in new technologies and motivates their engagement. The recommendation is a crucial and highly influential element in individuals' decisions, IoT providers need to take care of their branding and launch useful objects to foster users' trust and encourage them to recommend this technology to others. Trust reinforces user engagement. It minimizes the perception of fears associated with using new technologies. Several researchers have already confirmed that trust in new technologies drives a positive intention to use them. They state that users who do not trust the technology will not use it (Allagui & Temessek, 2005). For Chu and Kim (2011), a person who trusts a technology will be engaged since they perceive less risk in using it.

IoT developers must ensure that they gain the trust of users with the adoption of credible communication, active listening, and continuous improvement of offered services, security, and privacy measures. We recommend the implementation of effective R&D plans to differentiate from competitors and continuously launch useful and easy innovations to allow individuals to use them on their own, thus promoting their perception of control. The perception of being able to control the use of IoT for sports builds user trust and engagement. This finding is consistent with several previous studies in different contexts (Suh & Han, 2003). The favorable perception of control in the use of IoT for sports minimizes the impact of fears related to the security of use and the confidentiality of their data.

According to Hong and Cho (2011), user trust is multidimensional and can be divided into two aspects: trust in the technology and trust in the provider. In our theoretical model, this finding is

explained by analyzing social influence on user trust through the perception of control, which reflects trust in technology devices, and via provider credibility, which represents trust in supplier honesty and transparency. We explain therefore how the social environment reinforces user trust through these two fundamental aspects. Additionally, our analysis highlights the mediating effect of user trust in the relationship between social influence and user engagement, shedding light on the crucial role of trust in the successful adoption and long-term continuity of technology use. This result confirms the findings of Moriuchi and Takahashi (2022), who demonstrated that trust enhances engagement and the intention to reuse online technology among individuals.

### *5.2. Theoretical and Managerial Contributions*

The present study allows us to generate theoretical and managerial recommendations for companies, athletes, and professionals in the field. The results presented earlier prove the favorable impact of trust on engagement in the use of IoT devices where the personal data collected is sensitive since it is a relatively new technology on the market. This requires efforts from the providers of these IoT devices so that they are in touch with the market and users through the different possible communication channels (social networks, websites, forums, etc.). In this sense, it is highly recommended to focus on R&D to analyze the needs and expectations of users and better secure the data collected during transmission and storage using new security systems such as Blockchain technology (Yu et al., 2018).

This study adopts the vision that considers sport as a fertile ground for Quantified Self (Giquel & Guyot, 2015). The media trend put forward the need to follow a healthy lifestyle and focused on sports activity. The democratization and increased accessibility to sports practice have allowed the rapid evolution of the Quantified Self. This movement plays a social role, athletes can share their achievements online to compare them with other people's results to be happy and motivated. This practice is facilitated by several online platforms that aim at mutual encouragement and competition between athletes to achieve their goals. We believe that this era of the Quantified Self joins the vision shared by Rouvroy (2014), who considers that the human body is becoming a "new connected object" especially with the integration of measurement applications to smartphones and the democratization of Internet connection.

We validated the influence of the social environment (family and friends) on the perception of control, provider credibility, trust, and engagement in the use of IoT for sports. This finding is explained by the fact that the person will be engaged and trust an object if it is recommended by a member of his environment (family, friends, coaches, known athletes...). They perceive themselves as capable of using this technology without risk. Secondly, it is strongly recommended that IoT providers design devices that promote social interaction and facilitate the online sharing of individual achievements. This element is related to the degree of transmission standardization between different IoT devices on the market. Finally, we would like to highlight the importance of investing in online support systems to stay in constant contact with users and answer their questions to build trust with them.

According to a study conducted by IDATE in 2017 about the connected sports market, the success of IoT technology for sports has some difficulties such as the high price of these devices, the low battery life, and the problems related to the protection and privacy of individual data collected. IoT designers are called upon to take these weaknesses into account.

Furthermore, our study allows us to advance several theoretical contributions while focusing on IoT for sports. Most of the research has dealt with the behavior of IoT users in general without considering the specificities of the sports domain and use purposes and motivations. The present research focuses on engagement in long-term IoT use beyond the initial act of purchase typically influenced by the feel-good ideology and materialism that mark our contemporary society. The aim is to address the determinants of user engagement in the use of IoT for sports with athletes who use this technology to fully understand this target, see how they perceive this technology, and how they decide to adopt it. The choice to focus on athletes is justified by the fact that the factors that determine the decision to adopt a new technology in the field of sports are different for athletes, whether amateur or professional, than for non-athletes.

To our knowledge, this study is the first to analyze the mediating effect of perceived provider credibility, trust, and control in the relationship between social influence and engagement in the use of IoT for sport. This relationship provides insight into how the influence of the social environment acts on IoT users' behavior while promoting their trust and engagement. To our knowledge, this research is also the first to treat the two aspects of user trust namely trust on technology devices and providers in the context of IoT for sports.

## 6. CONCLUSION

User engagement is a key variable in relationship marketing and strongly affects the use of new technologies. The present research addresses the influence of the social environment on engagement in the long-term use of IoT for sport and shows the mediating role of perceived trust and control in this relationship. It contributes to a better understanding of the impact of a person's social environment on their decision to engage in the use of new technology. Our study, therefore, recommends that companies prioritize gaining users' trust and fostering their perception of control to encourage them to engage in the continued use of IoT for sport.

The present research is not without limitations. It is an exploratory study that aims to analyze mainly the influence of the social environment on engagement in the use of IoT for sport. First, we treated IoT for sport in general without distinction of brands or functionality which does not allow us to verify the impact of these elements (purpose of use, sensitivity of collected data, and others) on our group of respondents of different IoT. Moreover, our study did not consider the impact of gender and age on the variables of the theoretical model. For these reasons, it seems useful to us to enrich this model by integrating socio-demographic variables and to test it in a different cultural context to verify its impact on the respondents' perception and the relationship between the variables.

A future study seems important to integrate other factors that influence user engagement such as brand image, communication strategy, and competitive position. We suggest, therefore, to test this theoretical model on a specific brand to draw more precise recommendations. We have also chosen not to integrate variables related to the characteristics of IoT devices for sports. It would be interesting to determine the influence of these elements (interactivity, service quality, aesthetic appeal, etc.). These research topics will help complete the framework for understanding engagement in the use of IoT devices for sports.

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## Appendix A. Study Questionnaire

**Do you practice a sport activity?**
**- Yes**
**- No**
**Do you use IoT devices for sports?**
**- Yes**
**- No**

**Perceived provider credibility**

**CRD 1- I think we can trust the connected sports equipment available on the market.**
**CRD 2- Companies that have made this choice control this activity well.**
**CRD 3- The information provided by IoT providers is sincere.**
**CRD 4- I have no doubts about the intentions of IoT devices for sports providers.**
**CRD 5- There's no lack of professionalism on the part of IoT devices for sports providers.**

**Perceived Control**

**CP 1- The use of IoT devices for sports is entirely under my control.**
**CP 2- I have the resources, knowledge, and abilities to use IoT devices for sports.**
**CP 3- I can skillfully use IoT devices for sports.**

**Social Influence**

**INF_SOC 1- People who are important to me (family members, close friends) recommend the use of IoT devices for sports.**
**INF_SOC 2- People who are important to me (family members, close friends) find the use of IoT devices for sports useful.**
**INF_SOC 3- People who are important to me (family members, close friends) find the use of IoT devices for sport a good idea.**
**Trust in IoT for sport**

**I could use IoT for sports...**
**CONF 1- If I have a clear conception of the functionality.**
**CONF 2- If this technology protects the privacy of its users.**
**CONF 3- If I feel confident that I can keep them under control.**
**CONF 4- If I am convinced that the data collected by the IoT for sports is reliable.**
**CONF 5- If I believe it is risk-free to use them.**
**CONF 6- If it is safe to use them.**
**CONF 7- If the IoT for sport is useful.**

**User Engagement**

**ENGAG 1- Anything related to IoT devices for sports attracts my attention.**
**ENGAG 2- I like to use more IoT devices for sports.**
**ENGAG 3- I pay a lot of attention to anything about IoT devices for sports.**
**ENGAG 4- I spend a lot of my time on IoT devices for sports.**
**ENGAG 5- I am passionate about IoT devices for sports.**