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WHY DO USERS ACCEPT THE INFORMATION TECHNOLOGY? DESCRIPTION AND USE OF THEORIES AND MODELS OF THEIR ACCEPTANCE

¿Por qué los usuarios aceptan la tecnología de la información? Descripción y uso de las teorías y de los modelos de su aceptación

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KEYWORDS

Technological acceptance models
Behavioral intention
Behavior of use
TAM
UTAUT 2
Web of Science
MAXQDA software

ABSTRACT

The objective of this research is to understand, predict and explain what factors influence organizations and induce individuals to accept technology. Through the methodology of content analysis and based on the Web of Science database and through the MAXQDA software, this document analyzes and reviews the ten most important theories and models of technology acceptance used in recent years. This review offers a holistic view that will help future researchers to select the most appropriate theories to apply to their field of study.

PALABRAS CLAVE

Modelos de aceptación tecnológica
Intención de comportamiento
Comportamiento de uso
TAM
UTAUT 2
Web of Science
MAXQDA software

RESUMEN

El objetivo de esta investigación es comprender, predecir y explicar qué factores influyen en las organizaciones e inducen a los individuos a aceptar la tecnología. A través de la metodología del análisis de contenido y partiendo de la base de datos Web of Science y a través del software MAXQDA, este documento analiza y revisa las diez teorías y modelos de aceptación de tecnología más importantes y utilizadas a lo largo de los últimos años. Esta revisión ofrece una visión holística que servirá para que futuros investigadores puedan seleccionar las teorías más apropiadas para aplicarlas a su ámbito de estudio.

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1. Introduction

The recent expansion of Information Technologies and Telecommunications has greatly impacted human life in many aspects and it is characterized for it speed evolution in new areas of application. Devices that changed social interactions, modes of communication and labor approaches to work life, are not reduced to tablets, smartphones & social media networks, but there are many other areas to account for digital transformation (Mishra, 2012). Technology adoption defines acceptance and first access to use of a given technological device and novel products (Khasawneh, 2008). Studies that pinpoint adoption in the technology industry, evolved around understanding, predicting and providing a rationale for the variables that can be accounted for having an impact on behavior at the level of individual adoption, as well as, from an institutional standpoint. This approach shed light from a framework and conceptual model, that is developing on the variables that incidentally affect adoption from a behavioral standpoint (Gangwar et al., 2014). The key variables around new technologies and adoption rates contributed in modeling an explanatory framework for predicting attitudes, including rejection from the side of users. Considered as a main factor for success, user acceptance is key for a preliminary assessment in market implantation (Dillon et al., 1996; Phan et al., 2011). From a user standpoint, any new information that is being retrieved from a new technology, virtual reality, 5G, Cloud computing, AI, Big Data, Internet of Things, among others, when users are presented with a new development, their analysis and overall perception relies on previous knowledge arising from a predominant worldview, which is entangled in their social sphere. It is a process, elaborating a ground from acceptance based on previous beliefs; whether these are conditioning or irrelevant for acceptance, there are many variables - from a theoretical standpoint - that Information Technologies have been assessing for the last years.

2. Objectives

For the present study, we set out a chronological review of those theories and models of technology adoption that identified factors conditioning technology acceptance over the years; with the objective of answering recurring questions around technological innovation: what factors contribute to individuals adopting that technology? Will individuals adopt that technology? The approach that has been carried out to answer these questions consists of a synthesis of ten framework models developed over the years to understand the acceptance or rejection of technology. In general, these questions are based on the perceptions that individuals generate about different aspects related to the use of technology or innovation. From this overall aim, there are three specific objectives laid out as follows:

1. The first objective is to carry out a review of the existing literature on the main theories regarding their theoretical bases and their main constructs and to describe and classify the variables that predict the use of acceptance or rejection of technology.
2. The second objective is to confirm if these theories are still used today or if they have been rejected.
3. The third objective is to investigate the areas and disciplines of study that have been used to record any applications to the study of the acceptance of emerging technological innovations, and whether there are any triggers for negative perception and rejected adoption.

3. Methodology

Considering the scope of our analysis, the bottom-line approach anchors in literature review reporting on scientific, field related studies, that refer to technology adoption, based on the application of content analysis technique (Bardin, 1996). Thematic content analysis narrows down to specific terms and concepts relevant to our focus on adoption. Additionally, the technique is established on set lists of frequencies, search for words in context, and thematic identification and classification (Abela, 2002). The following stages have been established for the process of building a systematic approach, based on the work of Gough et al. (2017), see Figure 11:

1. The theories that are being reviewed in base to three levelers, follow the set stands for research by:
   - Relevant authors that covered the proposed area of study: Alexandre et al., 2018; Amsterdamska et al., 1986; Alomary et al., 2015; Legris et al., 2018; Taherdoost, 2018; Tarhini et al., 2015; Venkatesh et al., 2012; Yousafzai et al., 2007.
   - Amount of references, ranking its relevancy in the field: IDT: 133.477; TRA: 277.861; TPB: 538.621; SCT: 790.826; TAM: 563.951; MCPU: 19.493; MM: 516.922; TAM-TPB: 25.708; UTAUT: 225.272; UTAUT 2: 48.112.
   - Secondary sources pointing to its relevance and weight within the Information Technologies Scholar community: IDT: 2.131; TRA: 7.798; TPB: 18.559; SCT: 22.603; TAM: 21.089; MCPU: 370; MM: 15.058; TAM-TPB: 362; UTAUT: 7.092; UTAUT 2: 1.151.
2. A selected base for bibliography: Web of Science Core Collection, including the Journal Citation Report (JCR), which represents a trusted source for quality, ranked, references and it's highly regarded within the institutions overseeing research quality.

3. A set keyword for listing theories: "Innovation Diffusion Theory; IDT", "Theory of Reasoned Action; TRA", "Theory of Planned Behavior; TPB", "Social Cognitive theory; SCT", "Technology Acceptance Model; TAM ","Model of PC Utilization; MPCU", "Motivational Model; MM", "Combined TAM-TPB", "Theory Acceptance and Use Technology; UTAUT", "Extending Theory Acceptance and Use Technology; UTAUT 2".
4. An applied methodology using practical criteria for selecting specialized sources: first, via a chronological framework 1962-2021; second, a base of documents filtered from a narrow frame establishing sources for 2018-2021. The selected date agrees with common standard of Internet of Things within consumer demographics, as well as other technologies accessing a universal access to consumer market: cloud to the edge, chatbots, and autonomous vehicles (Gartner, 2018); last, considering technological change as a threshold to "Open Access" source: AI platforms and Business Analytics; these are laid out by following the Theory, documents, sequence: IDT: 573; TRA: 873; TPB: 3.321; SCT: 7.174; TAM: 1.810; MCPU: 75; MM: 2.502; TAM-TPB: 50; UTAUT: 1.245; UTAUT 2: 614.
5. Accomplishing a review via MAXQDA, a tool for content analysis that account for the selected terms for analysis in a registry along with a given context. This system allows selecting words that are processed within a transcription of a sentence, textual fragment, a piece of discourse, which in turn, yields a thematic regrouping (MAXQDA,2020).
6. A synthesis of results in report form of the review, after a quantitative measure of words along with the grouping of thematic nodes as extracted from the analysis.

4. Theories and models: historic overview

In this section, the results obtained from first phase in the analysis have been showcased, according to the studies and theories reviewed.

4.1. Innovation Diffusion Theory (IDT)

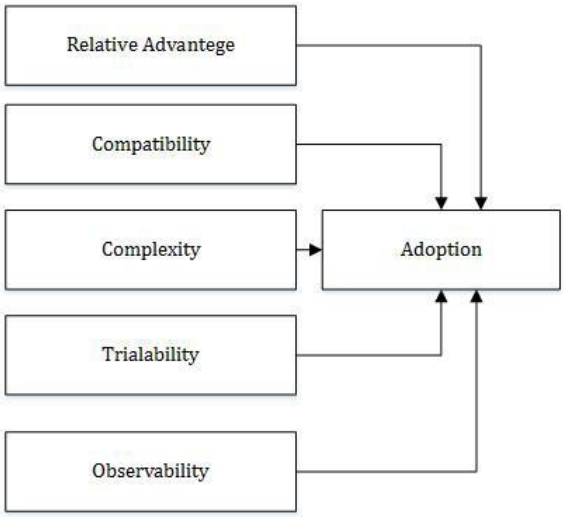
The origin of the *Diffusion of Innovation* theory was raised by a French sociologist, Gabriel Tarde, in 1903, and became popular in its elaboration, by Everett Rogers, in 1962. Rogers explained how individuals or groups adopt an innovation, and, also, defined the *Diffusion of innovation* as the process by which an innovation in the sphere of ideas, products, practices, and philosophy, is communicated through certain channels in a specified frame of time, between the members of a defined social system within the scope of the innovation (Rogers, 1962, 1983, 1995). The acceptance or rejection of an innovation necessarily goes through five stages: awareness, interest, decision, implementation, and adoption and, as a result, Rogers framed users as innovators, early adopters, early majority, majority late, and stragglers (2003). In addition, the author introduced five explanatory attributes that explain the pace of innovation, whereas some adapt more quickly than others: relative advantage, compatibility, complexity, testability, and observability (see Table 1 and Figure 2).

Table 1. Standard Constructs (IDT)

Constructs	Definition
Relative advantage	Rate of innovation to improve an idea, practice, or the objective for integration.
Compatibility	Rate of conformity for an innovation to be perceived along its value, from gained value to potential future value from user needs foreseen.
Complexity	Rate of difficulty relative to the know-how, skill and perception of usage around innovation.
Trialability	Rate of experimentation around innovation from potential users.
Observability	Rate of visibility of results derived from innovation in a specific context.

Source: adapted from Rogers (2003)

Figure 2. Innovation Diffusion Theory (IDT)



Source: Adapted from Rogers (2003)

4.2. The Theory of Reasoned Action (TRA)

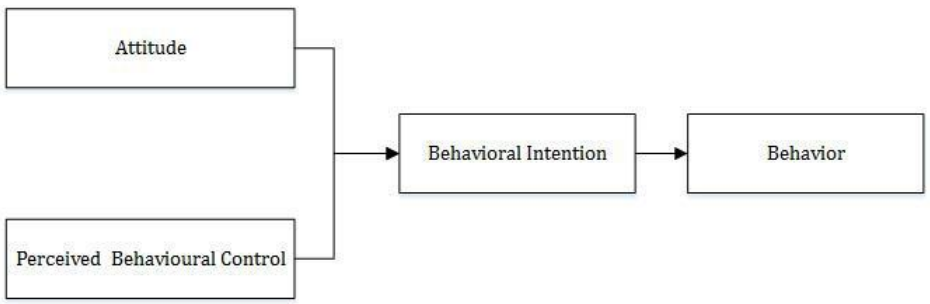
The Theory of Reasoned Action (TRA) is a model developed from psychology by Fishbein and Ajzen, in 1975, and, Ajzen and Fishbein, in 1980. It defines that the behavior of an individual is determined by her behavioral intention in order to perform the specified behavior; this basis provides the most accurate prediction of the behavior (Fishbein and Ajzen, 1975). Behavioral intention is influenced by two factors: first, attitude, a previous conditioning toward the behavior and subjective norms. The Theory of Reasoned Action describes how the behavioral intention will carry out a certain action as a result of attitude, not only towards the behavior but, also, towards the influence of subjective norms. Therefore, the intention to perform or to reject a behavior is an action prior to the behavior itself. This attitude will be conditioned by beliefs and by the evaluation, an individual assessment of the behavioral results; that is, a person will have a positive attitude towards that behavior if the individual thinks that the results of performing a specific action will be positive; instead, a person will have a negative attitude toward that behavior if he/she believes it will have a negative outcome (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980). The constructs determining behavioral intentions' rates of influence, are described below (see Table 2 and Figure 3).

Table 2. Constructs in TRA

Constructs	Definition
Attitude	It is a judgement scaled from two poles (negative to positive) towards a set behavior.
Subjective Norms	Social pressure exerted on individual and decision-makers in order to carry out an intention of behavior. It arises as a perception of others around a set behavior.
Behavioral intention	A cognitive representation for envisioning a specific behavior that is preset to a known behavior, by preceding it.
Behavior	A set action.

Source: adapted from Fishbein & Ajzen (1975) and Ajzen & Fishbein (1980).

Figure 3. Theory of Reasoned Action (TRA)



Source: Adapted from Fishbein & Ajzen (1975) and Ajzen & Fishbein (1980).

4.3. The Theory of Planned Behaviour (TPB)

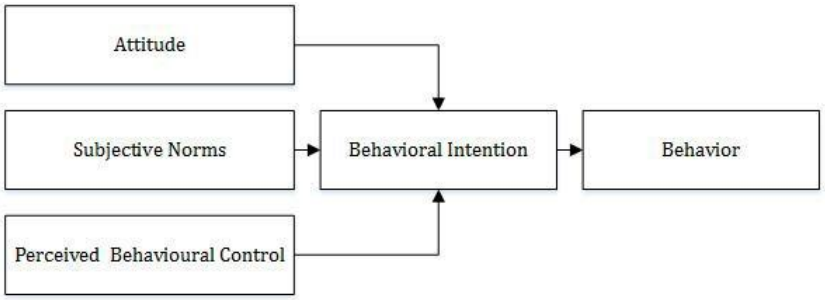
The Theory of Planned Behavior TPB (Ajzen, 1985, 1988, 1991) is an extension of TRA, by establishing an overpass to an underlying limitation: those behaviors over which people do not have complete control. The actual behavior from TPB depends, both, on the attitude towards the behavior, and, the subjective norms that incorporate a third construct, which is perceived as behavioral control, and it is described as perceived difficulty for an isolated behavior. This control of perceived behavior influences not only behavioral intent, but also actual behavior. The TPB has the ability to assess an individual's behavioral intention, based on his/her attitude, social pressure, and intentional motivation for targeted activities or for voluntary actions, see table 3 and figure 4 (Ajzen, 1985,1988,1991).

Table 3. Additional construct defined in TPB

Construct	Definition
Perceived Behavioural Control	A perception of the rate of difficulty in order to carry out a behavior from a set environment.

Source: adapted from Ajzen (1985,1988, 1991).

Figure 4. Theory of Planned Behaviour (TPB)



Source: adapted from Ajzen (1985,1988,1991).

4.4. Social Cognitive Theory (SCT)

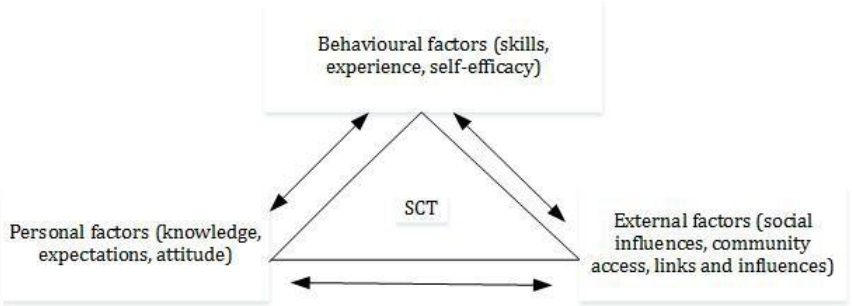
The Social Cognitive Theory is developed from the Theory of Social Learning (Miller and Dollar, 1941). SCT describes human behavior, with the objective of understanding, changing, as well as, predicting its outcomes (Bandura, 1986). From this broad perspective, behavior is consistent with learning and must be analyzed cognitively, that is, based on the information we receive from learning and previous experiences, since these will influence reinforcements and expectations, including behavioral action. These previous experiences will determine whether a person engages in a specific behavior and the reasons why a subject will engage. According to SCT, learning occurs in a specific social context, with dynamic and reciprocal interactions of people, behaviors and in a set environment. It includes the concept of self-efficacy, defined as a personal judgment about one's own ability to organize and carry out the actions necessary to achieve certain types of outcomes. This self-assessment is not based on skills, but rather on capacities that can be developed with a skill-set (Bandura, 1986). The SCT (see table 4 and figure 5) was not specifically designed to predict technology acceptance behaviors, but rather to provide information on the effect of individual characteristics, for self-efficacy, as a set of preliminary perceptions, linking to acceptance in outcomes, such as, acceptance of technology (Bandura, 1986).

Table 4. Constructs from SCT

Constructs	Definition
Personal factors (knowledge, expectations, attitude)	Individual traits associated with humans (knowledge, expectations, and attitude).
External factors (social influences, community access, links and influences)	Areas of influences from other than internal, personal, factors. These variables are from a set environment acting from physical realm, as well as social.
Behavioural factors (skills, experience, self-efficacy)	Individual traits associated with humans (skills, experience, self-efficacy).

Source: adapted from Bandura (1986).

Figure 5. Social Cognitive Theory (SCT)



Source: adapted from Bandura (1986).

4.5. Technology Acceptance Model (TAM)

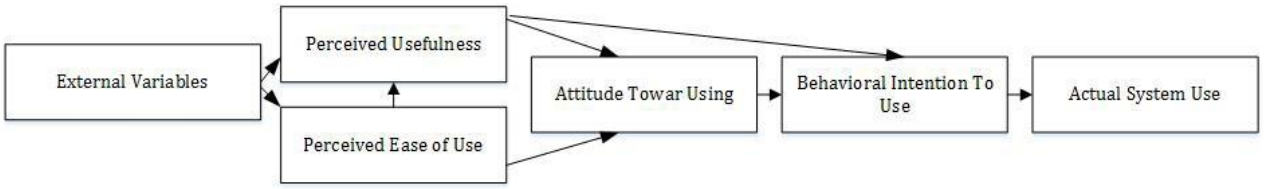
The Technology Acceptance Model (TAM) (Davis et al., 1989), is based on TRA, and it has been the most widely used approach to study technology adoption (Davis, 1989). It was developed to predict users' acceptance of information systems in organizations by analyzing the impact of external factors on internal beliefs, attitudes and intentions. This model holds that behavioral intention, in addition to being determined by attitude toward behavior, is, also, directly influenced by perceived usefulness and perceived ease of use, usage variables that are, in turn, influenced by other pre-existing factors (Davis et al., 1989). These two variables, received usefulness and perceived easy of use, are incorporated into the model, mainly because they are relevant to the acceptance of technology. TAM (see table 5 and figure 6) considers the attitude towards the use of technology and perceived usefulness, as being directly related to intention, prior to use of the technology. Therefore, the perceived usefulness constitutes a cognitive determinant of the behavioral intention, while attitude represents an affective component (Davis et al., 1989).

Table 5. Constructs from TAM

Constructs	Definition
Perceived Usefulness	Rate for individual usage of a specific system for perceived performance.
Perceived Ease of Use	Rate for individual usage of a specific system for non-added effort.

Source: adapted from Davis et al. (1989).

Figura 6. Technology Acceptance Model (TAM)



Source: adapted from Davis et al. (1989).

4.6. The Model of PC Utilization (MPCU)

Based on Theory of Human Behavior (Triandis 1977), the Model of PC Utilization MPCU was developed by Thompson et al. (1991). It differs in some features from Theory of Reasoned Action, considering that differentiates between cognitive and affective elements within attitude. According to MPCU, a behavior is determined by personal attitudes –what is projected as desired outcomes, a string of social norms–judgements on what it is required, and their habits, what they usually do–, as well as, a set of expected consequences of their behavior. This model measures the degree of use of a PC (computer) by a worker when its use is not mandatory within an organization, and the assignment of value is individual, depending solely on the user.

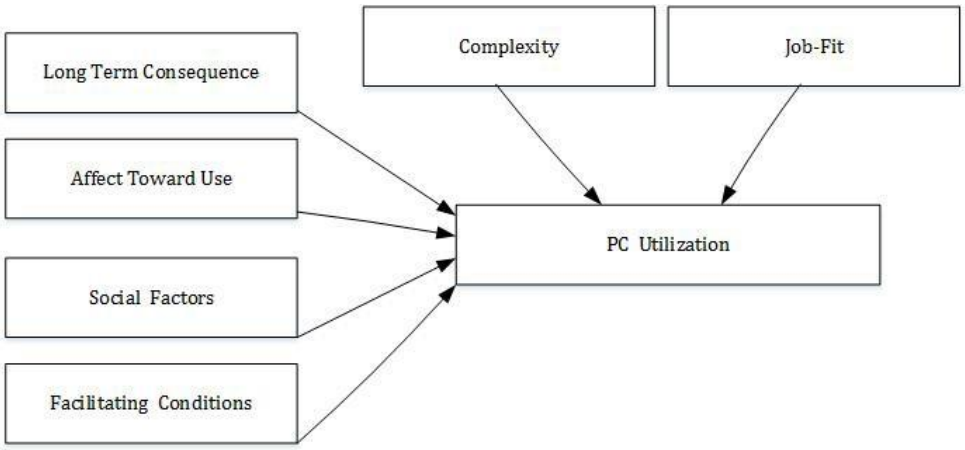
Aligned with this theory is the standard ground for PC use as likely influenced by factors, ranging from affect to norm, and habits. The user's feelings towards PC use, or affect, are linked to the workplaces' social norms about PC use. Standard habits related to its use, arise from consequences, previous experiences with a PC, and extend from the conditions that are actively playing out in the workplace. With these varying factors around usage, some of the constructs determining acceptance are described, as follows (see table 6 and figure 7):

Table 6. Constructs as defined in PC (MCPU) theory

Constructs	Definition
Job-Fit	Rate for an individual usage of a specific technology for overall performance at work.
Complexity	Rate of innovation perceived for its relative difficult in added knowledge and skills for it use.
Long Term Consequence	Results oriented to future reward.
Affect Toward Use	Feeling of enjoyment, cheerfulness, pleasure, anxiety, displeasure or dislike, associated with a specific action/behavior.
Social Factors	Internalization of subjective elements within a set group or tribe. Interpersonal agreement specific to individual behavior in similar social settings.
Facilitating Conditions	Providing technical support to PC users as a particular facilitating condition for system usage.

Source: adapted from Thompson et al. (1991).

Figure 7. The Model of PC Utilization (MPCU)



Source: adapted from Thompson et al. (1991).

4.7. Motivational Model (MM)

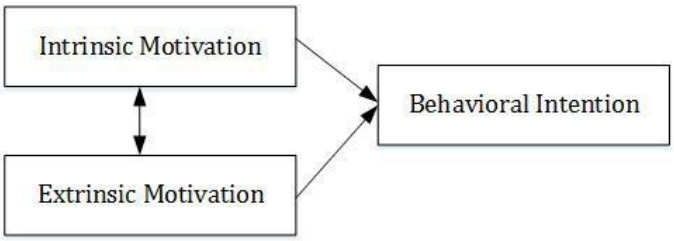
Motivation theory has relied on previous Psychology research to explain behavior. This model was proposed by Davis et al. (1992) in which they considered two factors as variables for a common ground: the intrinsic motivation of carrying out an activity for an inherent satisfaction rather than for any consequence or benefit derived from its execution. When a person is intrinsically motivated, they move to act for the sake of pleasure or for the challenge that the activity provokes, in favor of any expectation for personal rewards, incentives or any extrinsic motivation confirming that the behavior is driven by perceived value and its derived benefits (see table 7 and figure 8).

Tabla 7. Constructs in Motivational Model (MM)

Constructs	**Definition**
Intrinsic motivation	The completion of an activity for its inherent satisfaction over its consequences or benefits derived from the execution
Extrinsic motivation	A behavior promoted based on perceived value and derived benefits.

Source: adapted from Davis et al. (1992).

Figure 8. Motivational Model (MM)



Source: adapted from Davis et al. (1992).

4.8. Combined TAM and TPB (C-TAM-TPB)

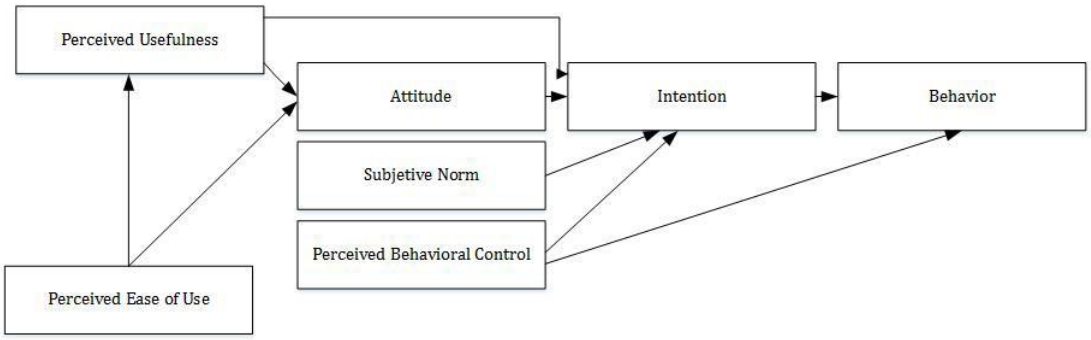
The theory that combines the *Technology Acceptance Model* (TAM) with *Planned Behavior Model* (TPB) is known by a combination of TAM and TPB acronym: C-TAM-TPB. It builds on previous studies by Madden et al. (1992) and was developed by Taylor and Todd (1995). This model is used to predict usage for people who have never used technology before and, also, for those who have used it and are familiar with it. The objective of the model was to incorporate the normative or social aspects and elements of control of the perceived behavior of the TPB, into TAM. Considered a hybrid model, the combined TBP TAM framework (see table 8 and figure 9) explains perceived usefulness and attitude towards use as factors conditioning behavioral intention, which, in turn, is influenced by subjective norm and inherent control (Taylor and Todd, 1995).

Table 8. Constructs in C-TAM-TPB

Constructs	Definition
Attitude	Assessment performed on technology by an individual.
Subjective Norm	Individual opinions (communal opinions) that effectuate a shift within a result.
Perceived Behavioral Control	It is linked to perception on the accessibility of resources and opportunity that are required for carrying out a specific behavior.
Perceived Ease of Use	Rate for individual usage of a specific system for non-added effort.
Perceived Usefulness	A subjective probability activated by users around a performance system; It will increase productivity at the organization level.

Source: adapted from Taylor & Todd (1995)

Figure 9. Combined TAM and TPB (C-TAM-TPB)



Source: adapted from Taylor & Todd (1995).

4.9. Unified Theory of Acceptance and Use of Technology (UTAUT)

The *Unified Theory of Technology Acceptance and Use* UTAUT was developed in 2003 to predict user adoption of information technology in a business context (Venkatesh et al.). UTAUT integrated eight previous relevant theories: *Innovation Diffusion Theory* (IDT), *Reasoned Action Theory* (TRA), *Planned Behavior Theory* (TPB), *Social Cognitive Theory* (SCT), *Technology Adoption Model* (TAM), *PC Utilization Model* (MPCU), *Motivational Model* (MM) and *Combination* TAM and TPB (C-TAM-TPB). In the UTAUT acceptance model, four main constructs are defined: performance expectation, effort expectation, social influence and facilitating conditions, which are the factors that determine the adoption of technology by the user; user's behavior depends on his/her intention and technology usage, and it impacts all four factors mentioned, PE, EE, SI, FC. The UTAUT model (see table 9 and

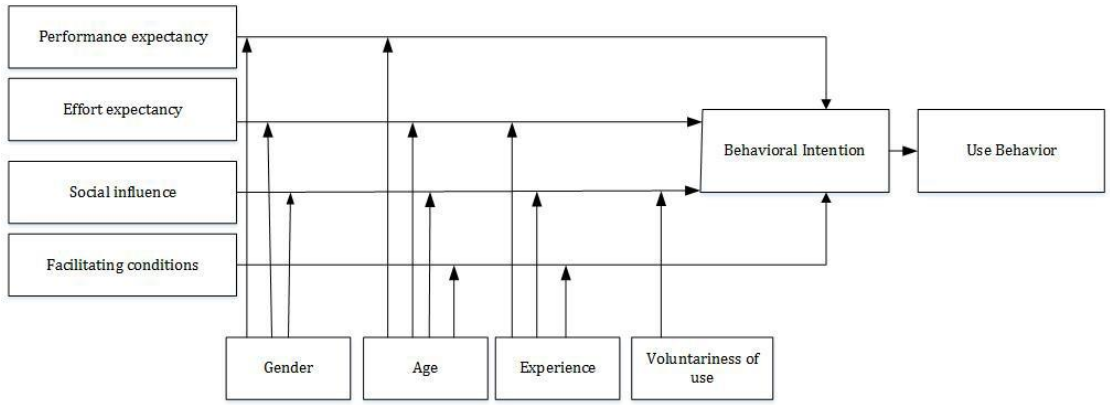
figure 10) considers variables from bands across identity variables, gender, age, experience, and voluntary use to modulate the influence of the four constructs along with behavioral intention and use of technology (Venkatesh et al., 2003).

Table 9. Constructs defined in UTAUT

Constructs	Definition
Performance expectancy	Rate of perception that an individual sees as adjuvant to improved performance and usage in the workplace.
Effort expectancy	Degree of difficulty associated to system usage.
Social influence	Rate of perception that an individual associates with prestige around the use of the new system.
Facilitating conditions	Rate of perception that an individual associates with an organizational structure and technical infrastructure backing up system usage.

Source: adapted from Venkatesh et al. (2003).

Figure 10. Modelo UTAUT



Source: adapted from Venkatesh et al. (2003).

4.10. Extending Theory Acceptance and Use Technology (UTAUT 2)

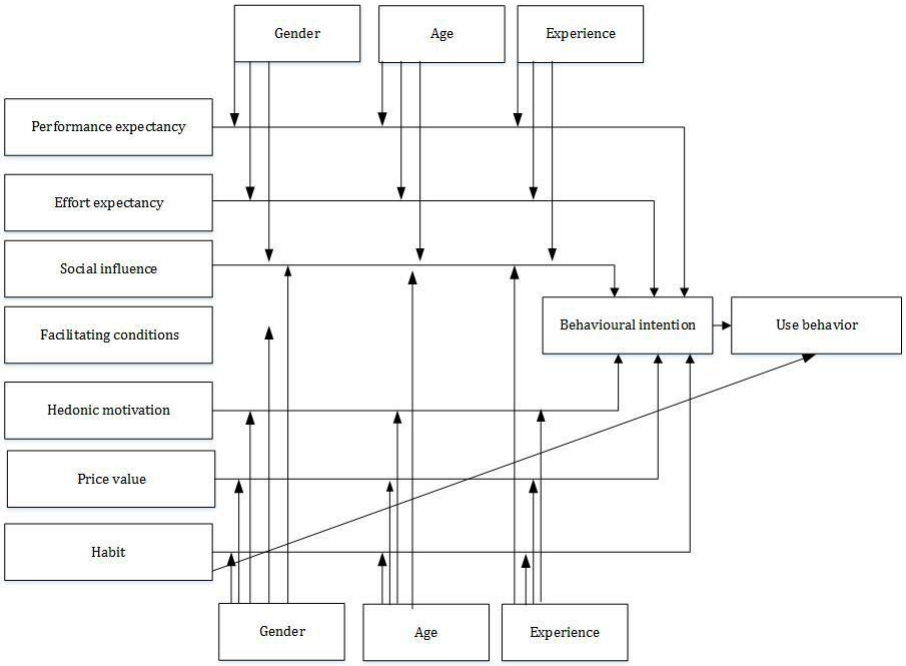
Since UTAUT arises for a context generic for organizations, Venkatesh et al. (2012) developed UTAUT 2, to include three new constructs: hedonic motivation, price/value and habit, factors oriented towards the acceptance of technology within an evolved framework to input consumers‘ behaviour. (see table 10 and figure 11).

Tabla 10. Constructs in UTAUT 2 model

Constructs	**Definition**
Hedonic motivation	Enjoyment and pleasure derived from technology use.
Price value	A cognitive reward at consumer, marketplace, level, for added benefits as these arise from some platforms, associated with its cost.
Habit	Rate for individuals measuring everyday behaviors, automated into learning.

Source : adapted from Venkatesh et al. (2012).

Figure 11. UTAUT 2 Model



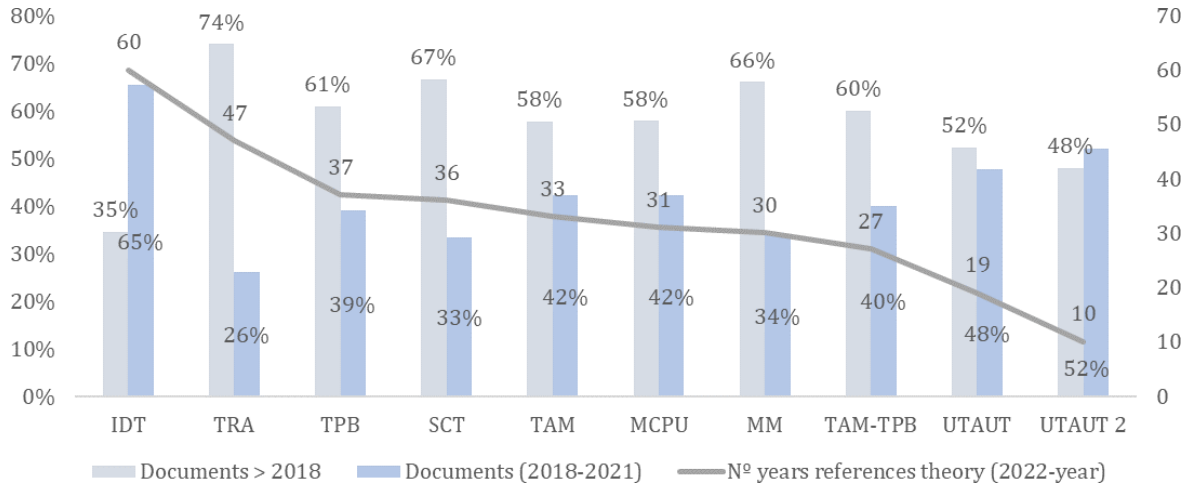
Source: adapted from Venkatesh et al. (2012).

5. Results

From a progression in history line up contrasting models and it relevancy, Figure 13 showcases the three variables activated for this analysis, namely: the number of years that the theory had links and references (2022-year); the number of documents produced from 2018-2021; and, the percentage of total production.

The percentage of qualitative research production for the years 2018-2021 versus the total production is represented in descending order: IDT: 65,5%; UTAUT 2: 52,0%; UTAUT: 47,7%; TAM: 42,3%; MCPU: 42,2%; TAM-TPB: 40,1%; TPB: 39,1%; MM: 34,0%; SCT: 33,5%; TRA: 26,0%.

Figura 13. Theories and models: historic overview



5.1. Thematic areas of study from the theories and models

The results of the analysis are presented as overview of the field in which the theoretical approaches are applied along with main topics from each model. These results, shown in tables 11-22, below, tackle the analysis of main areas of content as it relates to themes extracted from the relevant theories in technology, as stated third objective, to link behavioral intention to Technology Acceptance models.

Table 11. Thematic areas of study from the theories and models

Application areas	Thematic
Innovation Diffusion Theory (IDT)	
Business Economics, Computer Science, Environmental Sciences Ecology, Science Technology, Engineering, Information Science Library Science, Education Educational Research, Social Sciences, Public Administration.	Absorptive-capacity, banking, business, challenges, cloud computing, commerce, covid-19, drivers, e-business, education, electric vehicles, energy, facebook, food, ict, internet, internet banking, policy, services, social media, transformation, university.
Theory of Reasoned Action (TRA)	
Business Economics, Psychology, Philosophy, Computer Science, Social Sciences, Education Educational Research, Environmental Sciences Ecology, Science Technology Other Topics, Public Environmental Occupational Health.	Health; self-efficacy; physical; perceptions; determinants; attitude; metaanalysis;decision-making;beliefs;information;management;adoption;consumption;covid-19;information-technology;risk;care;user; technology; trust.
Theory of Planned Behavior (TPB)	
Business Economics, Environmental Sciences Ecology, Psychology, Science Technology, Public Environmental Occupational Health, Engineering, Social Sciences, Education Educational Research, Computer Science.	Adolescents, adults, children, mothers, parents, pregnancy, nurses, college students, covid-19, pandemic, vaccination, csr, social identity, sustainable consumption, ecotourism, education, e-health, entrepreneurship, entrepreneurship education, environment, collectivism, environmental sustainability, renewable energy, exercise, farmers, food, food safety, food waste, consumption, health, health education, higher-education, physical activity, policy, public transport, buying behavior, purchase intention, autonomous vehicles, internet
Social Cognitive Theory (SCT)	
Psychology, Business Economics, Education Educational Research, Neurosciences Neurology, Psychiatry, Public Environmental Occupational Health, Social Sciences, Computer Science, Sciences Ecology.	Care, covid-19, diet, health, ehealth, nutrition, obesity, pandemic, consumption, cooperation, culture, race, education, emotional intelligence, exercise, family, job-satisfaction, career, language, music, neuroscience, physical activity, power, psychosis, resilience, schizophrenia, self-efficacy, self-esteem, self-management, social media, technology, television, artificial intelligence, information-technology, internet, mobile phone.
Technology Acceptance Model (TAM)	
Computer Science, Business Economics, Engineering, Education Educational Research, Information Science Library Science, Science Technology, Environmental Sciences Ecology, Social Sciences, Psychology.	Apps, artificial intelligence, assistive technology, augmented reality, blockchain, classroom, cloud computing, e-commerce, computer-technology, digital divide, digital health, digital technology, digital transformation, e-health, e-learning, fintech, gamification, human-robot interaction, internet, internet banking, internet of things, machine learning, mobile applications, mobile devices, smart home, social media.
The Model of PC Utilization	
Engineering, Health Care Sciences Services, Energy Fuels, Chemistry, Oncology, General Internal Medicine, Environmental Sciences Ecology, Thermodynamics, Computer Science.	Consultation, health-care, management, model, optimization, quality, services, simulation, system.

Source: adapted from WoS & MAXQDA (2022).

Table 11. Thematic areas of study from the theories and models (continuation)

Application areas	Thematic
Motivational Model (MM)	
Psychology, Education Educational Research, Business Economics, Neurosciences Neurology, Public Environmental Occupational Health, Social Sciences, Psychiatry, Computer Science, Environmental Sciences Ecology.	Academic-achievement, academic-performance, adolescent, adults, alcohol use, efficacy, stress, suicide, effort, emotion, intelligence, physical activity, power, primary care, psychological needs, psychometric properties, quality-of-life, social support, sport, strategies, video games, classroom, gamification, college-students, social media.
Combined TAM and TPB	
Business Economics, Computer Science, Engineering, Environmental Sciences Ecology, Science Technology, Information Science Library, Education, Transportation, Social Sciences.	Covid-19, e-government, electronic commerce, higher-education, information, information-technology, integration, internet, internet banking, sharing economy.
Unified Theory of Acceptance and Use of Technology (UTAUT)	
Business Economics, Computer Science, Information Science Library, Education, Engineering, Science Technology, Environmental Sciences Ecology, Social Sciences, Health Care.	Assistive technology, augmented reality, automated vehicles, banking, big data, blended learning, blockchain, covid-19, e-commerce, e-government, e-health, e-learning, e-commerce, electronic health records, facebook, gamification, gratifications, ict, internet, internet banking, internet of things, mobile applications, banking, higher education, mobile health, mobile learning, mobile phone, sharing economy, smartwatch, social commerce, social media, telehealth, telemedicine, tourism, virtual reality.
Extending Theory Acceptance and Use Technology (UTAUT 2)	
Business Economics, Computer Science, Information Science, Library Science, Education, Social Sciences, Science Technology, Engineering, Environmental Sciences Ecology, Health Care Sciences Services.	Apps, artificial intelligence, augmented reality, commerce, culture, e-commerce, e-government, mobile learning, education, ict, internet, internet banking, internet of things, ehealth, mobile payment, privacy, sharing economy, smartphones, telemedicine, tourism, virtual reality.

Source: adapted from WoS & MAXQDA (2022).

6. Discussion

Below is a summary of the theories in chronological order, year, author and main determinants that predict the adoption of technology by individuals or organizations (see table 11). From our three-fold objective, stated as an overview of the theories or models used to explain and predict the use of technology, a definition set for predictive variables or constructs, we proceed to link concepts relevant to the theoretical frameworks, presented in table 11 for a global scope and snapshot summary and to provide understanding from its chronological evolution.

The second objective set out was an analysis in order to look closer at technology usage and whether the relevant theories are underlying or, whether they lost ground for application. The results confirm that all theories are still valid and remain a relatively valuable source in the field. Taking into account that the average number of years that theories undergo generational phasing, is around 32 years, then our scope for research and analysis on technology acceptance is justified on the weight and concepts laid out in more recent studies, by maintaining a scope around four years of production over total length of historic progression. It is shown that the IDT and UTAUT 2 theories have had a higher number of references by looking closely at the greater production in the last four years: 65% for IDT and 52% in UTAUT 2. Under this light, the fact that the researched technology is currently available overlaps with the impact of Covid-19 for wide access, resulting in an overall transformation of digital technologies and touching upon many sectors and across regions, with an international lens. Its global impact and speed in disseminating new technologies accessible to users underlies an added interest in studying the technology acceptance, from an academic viewpoint. The TRA model remains at the lowest point in the scale of production, which can be explained for three reasons, consider that it was first laid out as a theory 47 years ago and it wasn't developed in the field of technology; for these reasons, its scope is very limited for integrating concepts at play with behavioral intention.

Table 12. Theories and models, overview of historic progression

Theories/Models	**Year**	**Author**	**Constructs and factors for Adoption Technology**
Innovation Diffusion Theory	1962 1983 1995 2003	Rogers	Relative Advantage, Compatibility, Complexity, Trialability and Observability.
Theory of Reasoned Action	1975 1980	Fishbein y Ajzen Ajzen y Fishbein	Attitude, Subjective norms, Behavioral intention, Behavior.
Theory of Planned Behaviour	1985 1988 1991	Ajzen	Attitude, Subjective norms, Perceived behavioral control, Behavioral intention, Behavior.
Social Cognitive theory	1986	Bandura	Behavioural factors, Personal factors and External factors.
Technology Acceptance Model	1989	Davis	Perceived Usefulness, Perceived Ease of Use
Model of PC Utilization, MPCU	1991	Thompson, Higgins y Howell.	Job-Fit, Complexity, Long Term Consequence, Affect Toward Use, Social Factors, Facilitating Conditions.
Motivational Model	1992	Davis, Bagozzi y Warshaw.	Intrinsic motivation, Extrinsic motivation.
Combined TAM-TPB	1995	Taylor y Todd	Attitude, Subjective Norm, Perceived Behavioral Control, Perceived Ease of Use, Perceived Usefulness.
Theory Acceptance and Use Technology	2003	Venkatesh, Morris, Davis y Davis.	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions.
Extending Theory Acceptance and Use Technology	2012	Venkatesh, Thong y Xu.	Performance expectancy, Effort expectancy, Social influence, Facilitating conditions, Hedonic motivation, Price value, Habit.

The third objective for the present study, to deepen insight through an analysis of content that can be activated within the areas and themes common to diverse areas of investigation, is presented in the summary, in table 12. Although we depart from the acknowledgment around theories that are still valid, if we pursue a more in-detail analysis from the perspective of their application to technological field, then, the conclusions vary since only four theories are widely used across technological fields: IDT, TAM, UTAUT and UTAUT 2. Those framework models are applied to the study of technology acceptance in areas that overlap with very diverse fields of knowledge & specialization: artificial intelligence, mobile applications, assistive technology, augmented reality, block chain, distance classroom, autonomous vehicles, the cloud, electronic commerce, computational analysis, digital transformation, e-health, e-learning, financial technology, gamification, robots, internet2, internet banking, IoT, machine learning, SEM, smart home, social networks, virtual reality and mobile devices. The TRA, TPB and MM theories relied more in psycho-social factors, such as fear, stress, and personal identity, versus other theories that tend to focus on motivational studies, learning and ergonomics. Thus, our confirmation to provide a background context built in theories that are studying emerging technologies, from IDT, TAM, UTAUT and UTAUT 2 thresholds and concepts.

7. Conclusion

Considering that these models are similar in their presentation of behavior and usage, but differ in their account and conceptual angle, our review defined two sets of models and theoretical frameworks from their application: (1) models that are mainly applied in the field of technology; (2) models that are applied in social and psychological contexts and aren't fully validating for an explanation of technology acceptance. Starting with the Web of Science database that we based our data set analysis and keeping some of the limitations in the framework in sight, then the results can be extended to other databases that were not previously researched, for instance, Scopus and Google Scholar. Additionally, other theories that were not showcased in our study will provide another avenue for understanding user intention from a consumer behavioral standpoint. Finally, a possible field for future research could be delimited around those constructs that the authors have added over the years, from the theoretical perspective, in order to improve the predictive model in their studies.

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