BJIS Brazilian Journal of Information Science

THEORIES ABOUT TECHNOLOGY ACCEPTANCE: WHY THE USERS ACCEPT OR REJECT THE INFORMATION TECHNOLOGY?

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ABSTRACT

The acceptance and use of information technology is a subject that has received the attention of researchers and professionals in the Computer Science, Information Systems and Information Science, because the prospect that a well-developed system will be used, since start with the assumption that good solutions in software, can bring competitive advantage to businesses and individuals. Understanding why people use or discard computers has become one of the most challenging issues in research on information systems. In literature, it is possible to identify various theories that attempt to predict the impact of technology on human behavior however this article will make a brief review of literature on three theories. They are: Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB) and finally Technology Accepentace Model (TAM), model which will better explained, because it is the best known and used in the area of information systems.

Keywords: Technology Acceptance; Informational Behavior; Users; Information Technology.

INTRODUCTION

Studies and researches about technology acceptance, by individuals and organization have been written in the recent years under a great amount of approaches, presenting a strong growth on these initiatives from the middle of the 1990 decade. These studies are made with the intention to search constant enhances, and identify intrinsic and extrinsic factor involved in the decisions, intentions and individual's satisfaction, about the acceptance and the use of

information technology, through many tests and evaluation methods (DIAS et al., 2003; VENKATESH et al., 2003; SILVA, 2005; LOBLER, 2006). The research growth is justified by the meaningful use of information systems in the most different activities, changing the relation in all the social spheres.

The amount of information circulating today through the information systems is so wide that it is impossible to manipulate such information without the technology help, however according to Davis (1989) an information system of high technical performance will be good for nothing if the user, for any reason, do not adopt and do not accept the available technology. For Davis (1989) we need to understand the reasons why the users accept or reject some systems, to afterwards foresee, explain and modernize the systems.

The acceptance and the use of information technologies is a topic which has received the attention of researchers and professionals in the computer science area, information systems and information science, since that they work on the perspective that a well developed system will be used, because they start from the assumption that good solutions in software, may bring competitive advantages to the companies and/or to the individuals (BUENO et al., 2004; SALEH, 2004). However, a perceptible problem which disturbs the management activities of information systems is in the inability in measuring the quality of the delivered systems, as well as in the users behavior in using it (BUENO et al., 2004). To understand and create the conditions under which information systems are adopted by the human organizations remain, however, being a research area of high priority (VENKATESH; DAVIS, 2000).

According to Venkatesh et al. (2003) the technological innovations need to be accepted and actually used. For Dias (2002) the electronic way represents a new model in the dissemination of the information and should be explored on a full way. The studies about the users behavior have always been one of the most difficult areas and research in relation to the information systems, one of the failures cause, partial or total, of the information systems implementations is its not acceptance by the users, as well as its underspending or misuse.

The relevance of this work is in the fact that a few studies have been made presenting the models of technology acceptance most used in the evaluation of information systems acceptance. Thus, this is a very natural study and which has as

object a topic of current relevance in the information system area, because its focus is in the human aspects, not as element that suffer the technology impacts, but as active and fundamental element for the success reach in the establishment of an information system. When identifying variables which bear relevance or even that are determinants to get success in the use of information systems, it is obtained a valuable instrument in the management of projects related to these systems.

To use a model which measures the acceptance of a system, not only in a pre-establishment phase, but also afterwards, at a moment of higher stability, helps in the prevention of situations that lead to the failure of that process, or to the most effective use of the system after the establishment.

2 INFORMATION SYSTEMS

The information systems in the past were based in file techniques and information retrieval in large files, however with the computer popularization and technology this reality suffered deep changes, and almost all current information systems are supported by a computational base (Dias, 2006).

The information systems based in computer, according to Stair (1999) are systems that use hardware, software, database, telecommunications, procedures and people for the collection, storage, changing of data into information and the dissemination of this information. Moresi (2000) says that the information systems have been developed to optimize the flow of relevant information in the scope of an organization, triggering a knowledge process and of decision making and intervention in the reality. Rowley (2002) says that in a general way, there is a consensus that an information system should be strategic and contribute to make an organization reach its goals.

In the information systems, many are the instruments used to represent the knowledge of a given knowledge area, in the process of information recovery, the informative potential should be evaluated not only by the quantity, but also, mostly by the quality and access of possibilities to information, because, the speed with which we can get information depends on the use of instruments adequate to the clients reality. In short, systems may be evaluated as a set of inter-related parts, interacting

to reach certain goal(s) (ARAUJO, 1995). For Dias, (2006) the information system should comprise in its scope the necessary information to meet the demands of its users. According to Dias (2006) in the Information Science, it is perceived that the center of attention in respect to organization of information in the information system the most attention is given to the user of this system, as well as his search behavior.

Into the study about information search behavior, it is aimed to understand the processes experienced by the user in the research, what means, the user has a determined stage of knowledge and this stage is smaller than the necessary to solve any question or problem. Belkin (1980) evaluates this process as anomalous state of knowledge as search criteria.

The relations man-computer have been object of deep thoughts and studies, mainly in Information Science, because it works the interface between man and computer, with emphasis in the human side, relevance, utility, among others (SARACEVIC, 1996; PINHEIRO; LOUREIRO, 1995). The fact of giving more attention to computer systems and in the few attention given to its users, point to problems in the interaction users versus systems and the misuse of these technologies (AGNER, 2004). Actually all the efforts were more focused in technical features of the systems. Today there's already a concern about understanding that such tool is used by one person, and afterwards to study this person's behavior and characteristics, aiming only the possibility of improvement in the use of this system (MAIA; CEDÓN, 2005).

These thoughts and studies emerged due to the new technologies to processing and dissemination of information and its influence in the behavior of the society we live in, this is what Heemann claims (1997).

The information systems were mostly developed over time, always with the attention turned to the applied technologies and not to the strategic use or the adequacy to the users (STÉBILE, 2001). Arouck (2001) signs that since the decade of 80, were made periodically researches to determine the most critical questions related to the management of information systems, and among the admitted problems the evaluation of these systems, it was always present the effective use of the system, what means, the efficacy. The creation processes should be centered in the users, their interfaces should be designed with the objective to satisfy the user

needs. To Oliveira (2004) the systems that tend to bother or frustrate the users can not be effective systems, whatever is its degree of technical elegance and of effectiveness in the data processing. Such statements send us to the Mooers Law, which says that an information system will not be used if is harder to get the information, than not to get it (MOOERS, 1996; SARACEVIC, 1996; DIAS et al., 2003). An example we could quote Machado (2003) who refers to the quantity of bibliographic references rescued in one search in a determined system, that many times exceed the possibilities of the user to change it into information.

3 INFORMATION NECESSITY

The concept of necessity is widely discussed in the light of other sciences however we are going to use Kotler´s definition (1998), north-american researcher in the marketing area, for considering it the most appropriate for this study. For Kotler (1998), necessity is an absence state, of lack, a state in which someone is in needy of something basic and inherent to his life condition.

For Silva, Ferreira and Borges (2002), most of the studies already made present the user study as the most important influent factor to determine its information needs. However it is necessary to have as principle, the comprehension around the users needs, to build a system that answers their expectations, because researchers point that the users act and express their needs from the system perspective and from the information providers (SILVA; FERREIRA; BORGES, 2002).

Ferreira (1997) quotes that in some studies, the user who search and use information, should be aware of the sources and information services available in his environment, as well as, that his needs of information are influenced by the systems organization and by the thematic content available, including format, quantity and information update. Ferreira (1997) also contributes saying that the studies of need and information use evolved from a traditional approach to an alternative one. In other words it would be to claim that the approach focused in the (traditional) system advanced for the focused in the user (alternative). That is the explicit criticism to the traditional paradigm, for not bringing forth the users needs when searching for

information, leading with this the researchers to a new view, where the user becomes a client and like that, his cognitive and behavioral processes become the studies focus.

4 THEORIES ABOUT TECHNOLOGY ACCEPTANCE

Carvalho (2006) says that in the literature in Computer Science are commoner the studies turned to the technical components of systems, on the other hand the Information Science came to change this approach, giving more importance to the effective use of systems and of the quality attributes perceived by the users. To understand why people use or reject computers became one of the most challenging themes in researches about the information systems (DAVIS; BAGOZZI; WARSHAW, 1989).

Silva (2006) highlights the importance of not only having a technical view, what means, to direct the attentions to the requirements offered by technology, to understand the use of information technology, but to search to comprehend the behavior of who will use it. In the literature, it is possible to identify many theories which try to predict the impact of technology in the human behavior, however in this article we will make a brief review of literature about three theories which stood out as theories of technology acceptance. They are: Theory of Reasoned Action (TRA); the Theory of Planned Behavior (TPB) and finally the Technology Acceptance Model (TAM), model that will be on this work, detailed explained, because it is the most known and used in the area of information systems.

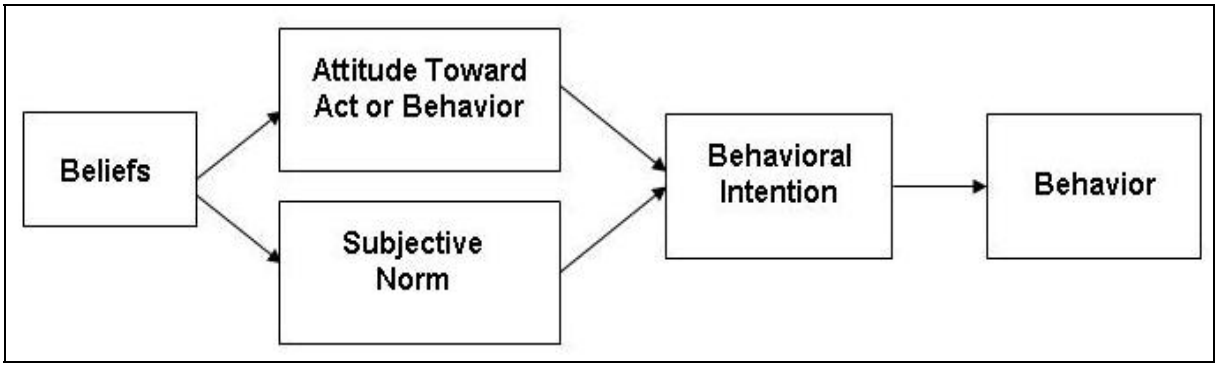
4.1 Theory of Reasoned Action (TRA)

The Theory of Reasoned Action (TRA) has its genesis in the social psychology that searches to identify the determinant factors of the consciously intentional behavior (FISHBEIN; AJZEN, 1979). Define the relations between beliefs, attitudes, norms, intentions and behavior, that is, a determined **behavior**, for example, technology use or rejection is the result of an **intention** in making the behavior, and this intention is influenced conjointly by the individual **attitudes**, been

this attitude determined by beliefs and **subjective norms** in relation to the aimed behavior (QUINTELLA; PELLICIONE, 2006). For Fishbein and Ajzen (1979) the elements that form the attitudes are the beliefs, that refer themselves to the information that the subject has about a determined object and the subjective norms, that is the perception of an external evaluation about adopting or not determined behavior. According to the TRA, the intention determines the effective behavior that refers to the observable acts (FISHBEIN; AJZEN, 1979).

We could exemplify the work TRA in the following way: it is imagined that a user who has the conscious intention to use a determined information system, derivative from the use attitude, which may be positive or negative, followed by subjective norms, which are referred to the perception that the user has of the other people's opinion. According to Oliveira Júnior (2006) the people choose to perform a behavior, even not agreeing with it and its consequences, in case they believe that a determined person thinks that this one should be his behavior and if they are motivated to please that person.

The model was used to make accurate predictions of human choice in many situations as to vote in the elections and alcoholic drinks consume, being found out that the theory adapted itself well in the prediction of choice among alternatives (DILLON; MORRIS, 1996). The model TRA is presented in Picture 1.



Picture 1: Theory of Reasoned Action (TRA).
Source: FISHBEIN – AJZEN – 1975.

The TRA considers that the people behave in a rational way, evaluating what they have to lose and to win with the manifestation of their attitudes. So, ideas, personal goals, values, beliefs and attitudes influence the behavior they emit at work;

if they believe, for example, that to share knowledge will bring them benefits, they will tend to be favorable to the sharing (FISHBEIN; AJKEN, 1979; DAVENPORT; PRUSAK, 1998.

The theory of reasoned action has already been widely researched and showed success in the prediction and explanation of human behavior in a variety of areas (DAVIS; BAGOZZI; WARSHAW, 1989)

According to Davis (1986), for being so generalized and also for integrating various theoretical perspectives of psychology, before applied in researches of acceptance of information systems, the TRA should be perfectly appropriate for the study of the determinants of the use of the computer as an specific case.

4.2 Theory of Planned Behavior (TPB)

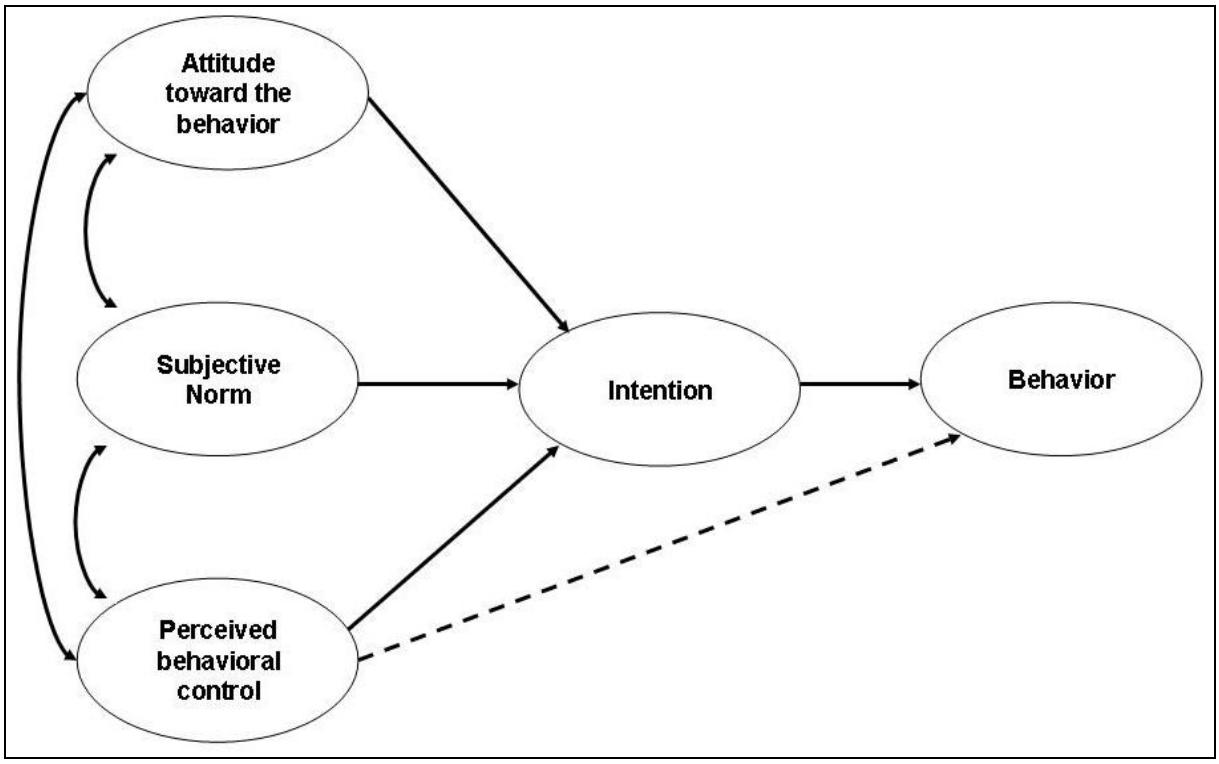
However the TRA has been used a lot to examine the user's acceptance, in relation to the technology, other theoretical perspectives were also used (DILLON; MORRIS, 1996).

More than a decade after the TRA, Ajzen (1991) proposes the Theory of Planned Behavior (TPB), which complements the TRA, aggregating to it more a construct intention of use: **perceived behavioral control** (DILLON; MORRIS, 1996).

According to Ajzen (1991) the TPB is a theory designed to foresee and explain the human behavior in specific contexts, for example, in information systems. The perceived behavioral control reflects the belief about the access to the resources and to the necessary opportunities to perform determined behavior (OLIVEIRA JÚNIOR, 2006). As general rule, the stronger the intention to get involved in a behavior, the more probable should be its performance.

Ajzen (1991) understand that the behavior intention is reflected in the behavior if the person decide on his own will to adopt or not the behavior, what means, by the perceived control that he has about the desired behavior. The behavior is the product of a succession of cognitive and affective events, preceded many times by the conscious intention of acting.

To a better comprehension about the TPB, we can observe, from a structural diagram, the similarity that this Theory has with the TRA, as mentioned before, only differing by the construct perceived behavioral control.



Picture 2: Theory of Planned Behavior (TPB).
Fonte: AJZEN – 1991.

4.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model, most known as technology acceptance model (TAM), was proposed by Davis (1989), being an adaptation of the model Theory of Reasoned Action (TRA), already mentioned before. However, according to Davis (1989), for being so universal, the TRA was modified specifically, to create models of acceptance in information technology, as in the specific case of TAM.

The intention of the development of the model TAM resulted from an IBM Canada contract with the *Massachusetts Institute of Technology* – MIT, in the 80 s to evaluate the market potential to new products of the brand and to make it possible an explanation of the determinants of computers use (DAVIS; BAGOZZI; WARSHAW, 1989).

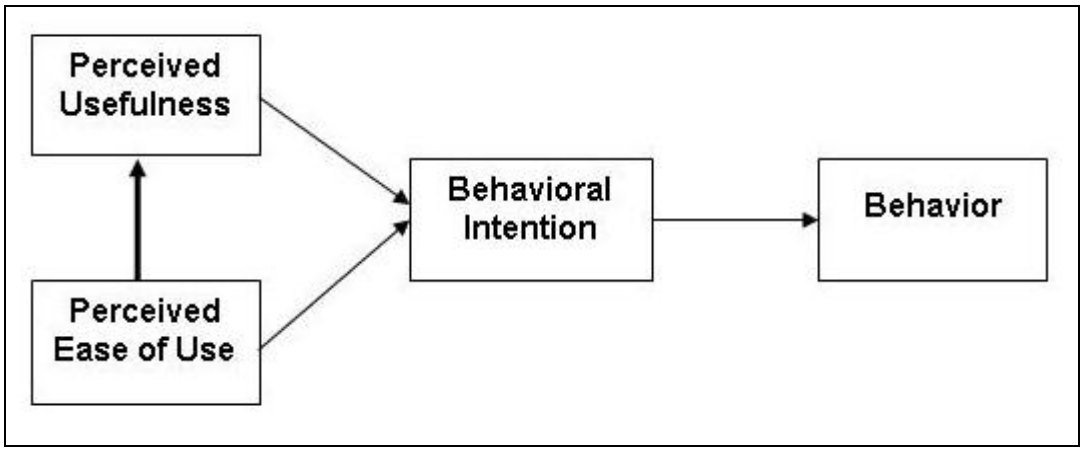
Davis (1989) proposed the TAM to focus in the reason the users accept or reject the information technology and how to improve the acceptance, offering, this way, a support to foresee and explain the acceptance. Davis (1989) conducted a *survey* in a group of 112 users at the Canada IBM and in 40 MBA students of Boston University. The validation of the TAM model was based in the acceptance of a software text editor (DAVIS, 1989; SÁ, 2006).

Silva (2006) adds that Davis (1989) on this sample found out that the perceived use had higher impact in the behavior than the perceived facility. The TAM has the advantage of being specific to information technology and has a strong theoretical base, besides the wide empiric support, as claims Davis (1989).

The model TAM was designed to comprehend the causal relation between external variables of user's acceptance and the real use of computer, trying to understand the behavior of this user through the utility knowledge and use facility perceived by him (DAVIS, 1989). For Davis (1989) the people tend to use or not certain technology with the objective to improve his performance at work – perceived use. However, even if this person understand that determined technology is useful, its use may be damaged if it is too complicated, in a way that the effort is not worthwhile the use – perceived facility. This way, the TAM is based basically in two constructs: the perceived utility and the perceived facility, seeing that both measured completely the effects of external variables, such as features systems, development process, training, in the use intention (DAVIS, 1989). The intention of this model is to represent the impact of external factors related to the information system, under those internals of the individual, as the attitudes and use intentions (DAVIS; BAGOZZI; WARSHAW, 1989; DAVIS 1989; DILLON; MORRIS, 1996; LEE et al., 2003; VENKATESH et al., 2003). Davis (1989) defines the two main determinants of TAM on the following way:

- Perceived utility – degree in which a person believes that the use of a particular system may improve his performance;
- Facility of perceived use – degree in which a person believes that the use of an information system will be free of effort.

The exposed in the Picture 3 suggests that the individuals will use a determined technology if they believe that this use will provide positive results, focusing in the **perceived ease of use** and in the **perceived usefulness.**



Picture 3: Technology Acceptance Model (TAM).
Fonte: DAVIS – 1989.

According to the model, the use of the information systems would be determined essentially by the use intention that the individual presents. This, in turn, would be determined together by the individual use attitude in relation to the real use of the system and by perceived usefulness, each one exerting a relative weight. This relation between attitude and intention suggests that people form intentions to perform actions to the ones they have a positive feeling. On the other side the relation between perceived usefulness and use intention, is based on the idea that, inside an organizational context, the people form intentions in relation to behaviors which they believe will increase their performance at work. The authors Davis, Bagozzi, and Warshaw (1989) presuppose that the saved effort, due to the improvement in the perceived usefulness ease may be applied in other tasks, consequently allowing that one person carry out more work with the same effort, this way having a direct effect in the perceived usefulness. Perceived usefulness use has a causal effect in perceived usefulness. The effects of external factors in the use intention are mediated by usefulness and ease (DAVIS; BAGOZZI; WARSHAW, 1989; DILLON; MORRIS, 1996; LEE et al., 2003; SILVA, 2005; VENKATESH et al., 2003).

As the model is behavioral, it may refer only to questions related directly to the user and his perceptions about the system use. So the constructs should be developed in a way to capture personal opinions and treat assumptions in respect to thirds (persons or institutions) (SALEH, 2004). This model is useful not only to prevent, but also to describe, in a way that researchers and professionals may identify the reason for not accepting a system or technology in particular by the users and, consequently, implement the appropriate corrective steps (DAVIS; BAGOZZI; WARSHAW, 1989; DAVIS 1989).

The model TAM has received theoretical and empiric support, through validations, applications and replicates made by researchers and the information technology area professionals. Lee et al. (2003) conducted a meta analysis of literature about the TAM and in general, found out that the model showed coherent results, keeping its efficacy in the explanation of technology acceptance by the users of information system, been applied in different technologies, as, for example, text processors, e-mail, internet, bank and hospital systems, as well as different situations (over time and cultures), with different control factors (sex, types, and organizational size) and different subjects (graduation and pos-graduation students, and free professionals), which leads us to believe on its strength (GAGNON; MCCARTHY, 2004; HONG et al., 2002; LOBLER, 2006; LEGRIS; INGHAM; COLLERETTE, 2003; LEE et al., 2003; MANTZANA, 2007; SÁ, 2006; SALEH, 2004; SILVA, 2005).

According to Lee et al. (2003) a proof of the TAM popularity is that in specialized literature in the year of 1989, age of its validation, received 424 citations, the researchers obtained this information through the *Social Science Citation Index* - SSCI, a citation index, edited since 1972, which presents the number of times in which an analyzed article was quoted at the journals covered by the index. The SSCI covers the literature produced in 2.500 titles of journals in more than 50 disciplines, in the areas of: Information Science and Librarianship, Psychology, among others.

The researches related to the adoption of information technologies, as well as the evaluations of their impacts are important activities in the investigation of information systems, whatever it deals with organizational contexts or the society. Consequently, the companies and the society need to develop, not only a culture generally positive, but specific cultural characteristics which maximize the technology

use to the performance of their employees day after day (MCCOY; GALLETA, 2007; RAITOHARJU, 2007; SALEH, 2004).

Besides the important investigation body associated to the adoption of information technologies, it still can not explain all the phenomena that are associated to it. Such fact is due to, on one side, to the complexity of adoption processes, mainly because they involve persons and interfere with their perceptions of cognitive nature, the ones which not always govern themselves by the organizational interests (before are affected by matters of individual and cultural nature); and, on the other side, to the nature strongly dynamic and evolutionary of information technologies, changing very fast the technological paradigms and creating new investigation fields (MCCOY; GALLETA, 2007; RAITOHARJU, 2007).

CONCLUSION

It is growing the need to understand how the intern and extern may affect the ability of an organization in adopting and using information technologies. The acceptance is a critical factor to the success of the information technology.

And what are the goals of the theoretical models of the technological acceptance here shown? The TAM, TRA and TPB goals are to provide a generic base to investigate the information technology acceptance determinants, able to explain the user behavior through a wide range of computational technologies and user population and at the same time being theoretically justified. These models are useful not only to foresee, but also to describe, in a way that researchers and professionals may identify the reason for not accepting a system or technology in particular and, consequently, implement the corrective adequate steps (DAVIS, BAGOZZI; WARSHAW, 1989)

The processes of the technology acceptance, as reflected at the TAM, TRA and TPB, are each time more important at the organizations. Consequently, the behavioral and acceptance variables need to be well comprehended, to avoid wastes and the effort of a great number of researchers who develop the information technology.

The theories here shown bring major reasons for future researches about understanding why the user accept or reject the information technology and how to improve the acceptance.

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Article received: 2008, January

Article Accepted: 2008, May