

The role of technology acceptance model (TAM) towards information systems implementation success: A Meta-Analysis

Abubaker Kashada, Eiman Ehtiwsh

Computer Department, Um-Alrabee College for Science & Technology, Surman, Libya

ABSTRACT

The freedom to formulate one's own judgment within a highly innovative society can render one incapable of accepting new technological developments. Seemingly benefiting from the backbone solidity of a coherent technological society, the conventions created by people to accept objects and values may render them in a difficult position when it comes to novelty in information systems and technology. Measuring the role of technology acceptance model (TAM) was built upon an ample literature review that resulted into content analysis of the prominent technology acceptance theories. The data collected through literature review further expanded our research into a qualitative analysis that was conducted using the model built around the TAM theories. We shared and treasured through an NVivo analysis the experience and attitudes of participants directly involved in the implementation of information systems: Technical Consultant, Product Manager and Business Analyst.

KEYWORDS; -Technology Acceptance Model, IT/IS Implementation Success, IT/IS Adoption

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I. INTRODUCTION

Imagine a world crumbling around you. We are facing an astonishing increase in events that can result into a crumbling of the world around us, no matter whether you are an individual or a company. In its more straightforward sense we are facing constant dangers, some of them not among the natural threats that have plagued mankind from its incipit. Earthquakes, floods, fire send shivers down our spines, but similar feelings of discomfort we feel when we consider the loss of electricity, supply of water even something like internet or computer access. We may ask ourselves how important are information systems in our global interconnected world and we would have to consider that the world runs on information systems that are tasked with different jobs. Because of their close relationship with confidentiality, security, integrity and availability information systems are indispensable in ensuring that projects do not fail. System implementation evokes unseen worlds that cover soft-skills, information, know-how, as well as cultural patterns and cultural acceptance models. The implementation of a system moves beyond the appearances represented by top management support, the training and know-how of the individual, the solidity of the team, to more social paradigms such as organizational communication, user oriented marketing, as well as user orientated implementation, to deep hidden patterns of cultural acceptance. Cultural patterns, as part of the inherited set of conventions that guide the behavior and choice of the user, are inherently preserved, thus, the system implementation team should turn to good account their existence. A proper understanding of these cultural patterns can facilitate the implementation of information systems. In other words, the implementation team should realize that cultural acceptance is a compulsory ingredient in the developer's recipe for what a good information system implementation should be and in this knowledge it had to be profited by. Information system implementation should be thus assimilated to an understanding on the cultural acceptance model of the user and when possible on the cultural acceptance model of the team in charge of implementing it.

II. LITERATURE REVIEW

We would say that acceptance theory can be considered a sort of "probing beyond" and with the passing of time, such theories have become more specialized and highly analytical. There are several models, some that shall be discussed in this paper, that through more or less subversive techniques were intended to bring under the critical lens of the public the potentialities and limitations of technology as a result of the degree of acceptance of users towards it. Acceptance and acceptance of technology involves the questioning of the person of the appropriateness of an issue or object in one's own life [1]. The point of these models is to understand the intention of the person and the very potentialities of a piece of technology to being accepted by a group of people. As an investigation instruments, such models are intended to into the darkest recesses of the level of acceptance of a person towards anything and towards an object and towards technology [2]

According to Fishbein and Ajzen [3], in 1975, individuals, without becoming aware, have a set of beliefs that signal behavior [4]. Entering the individual's consciousness, the authors note that technology is either accepted or rejected based on the person's distinct beliefs that voice his attitude, which in turn result in a particular behavior. The person identifies the advantages of a technology together with the effort it has to invest in order to use it [5]. The separation line between accepting and rejecting a technology is the result of a tradeoff between these two paradigms. This formula for acceptance is known in scientific circles as the Theory of Reasoned Action (T.R.A.).

The narration of the Social Cognitive Theory, in 1986, would have to include the fact that in accordance with its paradigm the person accepts based on the constant negotiation of three entities which are personal factors, behavior factors and environmental factors [6]. We may thus say that acceptance is the result of these factors interacting in a dynamic and reciprocal process. The above mentioned factors perform, roughly speaking, individual behavior. This theory renders the fact that the choice made by a person, the level of acceptance he manifests, is in direct nexus with antecedently regulated thoughts that are manifested, becoming what a person "really thinks" from silent thoughts that are linked with personal, behavior and environmental factors. Behind the mask of behavior lies the expectations of the individual [7]. The preference for a specific technology is in link with the ambiguous nature and the highly delusive characteristics of anxiety, effect and outcome. The outcome is present under two forms, the outcome expectations performance and the outcome expectations personal.

Rogers [8] deserving of a place in the history of acceptance models through his Innovation Diffusion Theory or I.D.T. from the year 1995. It marks a clear difference to the models that preceded him through the considering of friability, observability, complexity, compatibility and relative advantage [9]. Unlike any of his fellow researchers he considered that way in which a new idea, a novel process or a never before seen technology manages to enter the social system. While displaying clear affinities with the Combined T.A.M.-T.P.B developed by Taylor and Todd in 1995 [10] because it considers compatibility and complexity, translated as being the perceived ease of use and of the relative advantage, it confronts the public with a very elaborate model for understanding acceptance. The model of this author is considered to be the permanent theory of acceptance of innovation. The fact that it is considered appropriate for both company and individual understanding underlines its deeper meaning. It is our scientific duty to remark the fact that it is a model that obviously and clearly succeeded in anticipating the models to be perfected later on. Its author seemed willing to move beyond the comfortable area created by the past researchers.

In its most straightforward sense, in 2008, the U.T.A.U.T or The Unified Theory of Acceptance and Use of Technology is taken to combining four determinants. This theory takes performance expectancy, effort expectancy, social influence and facilitating conditions to evoke the unseen world of acceptance of an individual towards technology. It tries to understand the hidden order of acceptance and serves this purpose by moving beyond those indicators unto moderators of willingness to use [11], age of the person, and experience of the individual, coupled with the gender. Being interested in the beyond of things, Venkatesh&Bala[12] have improved their T.A.M. with T.A.M3 in which they facilitated understanding acceptance through the assimilation within the model of self-efficacy, computer anxiety together with computer playfulness, along with the perception of external control. Even more importantly, in venturing towards those hidden zones of acceptance as human behavior towards technology, they have also included two variables, enjoyment that is perceived by the individual and the objective view of the person on the usability of that technology [13]. This is a move from indeterminacy towards a more practical and ground to earth attitude, which contributes to a better understanding both the level of acceptance of a person towards technology and the worldview that triggers this acceptance.

The T.A.M. model comes with a new realization, that of the link between usefulness and actual intention to use. In short, the attitude of the individual determines the real behavior. The dynamics do not stop to this point, but continue with the conclusion that behavior influences the actual acceptance of a technology. Although the model presents clear improvement, it continues the history of models that lack the social perspective, as well as forgetting to take into consideration the cultural aspect that is part of any decision making process. Furthermore, we notice that it misses the importance of self-regulations. This model fails to understand that rarely and individual acts in isolation from the others [14]. We believe that the models that developed out of this one took into consideration that we, as humans, act interpersonally, not in isolation. Besides acting interpersonally, we act jointly with others or for others. Technology is the product of collaborative thinking more often than not and it should be natural to believe that the acceptance of technology is also the result of a collaborative effort.

In fact, analyzing the models we notice that the U.T.A.U.T. represents a successful synthesis of acceptance research that has been conducted before its appearance. The notion of performance expectancy should be defined in nexus with consumer technology, resulting in the realization that it represents the degree of benefits perceived by the consumer as possible in the moment he is confronted with the decision of accepting a technology. There are three stages that construct this level. One stage represents the interaction with the piece of technology. The second is represented by a consideration of the activities for which the individual needs the technology. Continuing our line of argument, we have to note that the third is represented in our scientific paper by bringing

together those two. By doing this we realize the presence or absence of worth at this level. We are referring to worth in action terms and utility, not in value. The second stage represents an analysis to which the consumer is obliged to think about; the ease of use of a technology. This is an important aspect that drives both marketing and development of new technologies. It is the basis for modernization because it employs a product already familiar to the consumer, but it augments its utility with innovations. This model includes the interaction of the individual with the society. The acceptance of a technology is directly linked with the perception that those closest to the consumer have towards that asset [15]. Another important aspect in direct link with acceptance towards technology is the profile of the user and his relationships with friends or family. In the eventuality that he highly praises the product, the user that has a strong social relationship with the one recommending it shall accept that technology without too much consideration. Again, we have to remark that considering family and friends it represent only simple and practical examples, but considering a broader general perspective this construct relates to individuals that present emotional influence to the consumer. That is why a lot of products are marketed using families, groups and a broader context of acceptance [16]. It is paramount for us to remark the fact that for the consumer it is indeed important to feel that his acceptance is not alone, but is indeed a small but integral part of a wider acceptance towards that technology. If this construct refers to the social infrastructure around the consumer, the next construct refers to the logistics around the technology. A technology shall be accepted with greater ease when it is accompanied by facilitating conditions. This construct refers to the infrastructure that surrounds the product and makes it a lot more usable and user friendly. It is very difficult to promote one product, because the consumer shall place it in the context of his other products [17]. It is a sort of “matching” products together. If a company offers a wider range of products, it can end up promoting one product through the others. Similarly, having one product may make you consider the purchase of another that goes well with the other in terms of functionality or context. Accepting one technology opens up the doors to all other technologies that augment or complement the first one [18]. At this point in our research, it is important to underline the fact that we consider it to be a natural course of things that in its turn will most definitely result in the creation of wide and general acceptance towards technology.

It is very interesting to note that this model incorporates the hedonic motivation that represents the simple joy of using technology. Indeed, joy and pleasure is a powerful driving force. It plays an important role in the acceptance of technology. The consumer use of context triggers a highly evocative image. Realizing this, Venkateshin 2012, has held to express in the Extending Unified Theory of Acceptance and Use of Technology (U.T.A.U.T.2) the concrete and perceptible consumer use of context. The imagery of the context includes in this model not only the variable of price, but also, the independent variable of hedonic motivation and habit. Yet, the author understands that no matter how important these independent variables may be to the correct decoding of acceptance towards technology, the researcher should never forget that they take meaning only within a more comprehensive framework that includes age, experience and gender. The comprehensive framework created with this model, thus, includes these moderating variables.

THEORY MODEL	INDEPENDENT VARIABLES	MODERATORS
Theory of Reasoned Action (TRA)	1. Attitude toward behavior 2. Subjective norm	1.Experience 2. Voluntariness
Social Cognitive Theory (SCT)	1.Outcome expectation 2. Self-efficacy 3. Affect 4. Anxiety	None
Innovation Diffusion Theory (IDT)	1. Relative advantage 2. Ease of use 3.Result demonstrability 4.Triability 5. Visibility 6. Image 7. Compatibility 8. Voluntariness of use	Experience
Unified Theory of Acceptance and Use of Technology (UTAUT)	1.Performance expectancy 2. Effort expectancy 3. Social influence 4.Facilitating conditions	1. Gender 2. Age 3.Experience 4.Voluntariness

Table 1. (Comparison between models discussed)

Due to the centrality of the technology in our contemporary world and the presence of a global market, developers of hardware and software solutions have to market their products considering the international market [19]. For example, software developers challenge the perception of non-English speaking countries when they apply “culturalization” to English-language software. In essence, these developers have to adapt the user interface not only to the specificity of the language, this is the easy part, but when considering the acceptance models discussed earlier, they have to make an effort to adapt the differences in culture to usability and acceptance.

In the next part of our paper we shall discuss a few example of acceptance of technology. France, for example, manifests a very protective attitude towards the history integrity of its own language. As a result, no matter the government in place, the main demand is for a software to be fully localized in France. Another example, is the software of LYRE. This software is used in France to teach poetry. The pupils were free to analyze the poems but were incapable of inserting their own viewpoints on them within the software. While in France it was culturally acceptable to insert this limit, the software was rejected in the Scandinavian countries precisely because it did not allow students to insert their own comments.

If we analyze societies from the paradigm of individualism and collectivism we would find research that demonstrated that in individualist cultures the decision to adopt an information system or a piece of technology lies on the individual [20]. The decision to adopt the piece of technology rests solely with the individual, whereas, individuals with a collectivist values will focus on maintaining their membership to the group, as a result the acceptance of technology shall rest on the opinions of the group. Interested in maintaining the relationships that are created within the group, people in collectivist societies shall give prominence to the values of the group and the technology accepted by the group.

Furthermore, understanding the acceptance of technology requires placing the world in another couple of paradigms. On one hand we have the individuals that are concerned with time, individuals that belong to cultures placing an increased emphasis on monochromic time. On the other hand, we have individuals that are more keen in developing interpersonal relationships and try to avoid schedules. The first category of people shall be more accepting of technology and I.T. in general because it gives them the ability to control time and time is the most important resource for them. The second category of culture shall be less accepting of technology, seeing as a possible barrier towards interpersonal growth. In this context, technology becomes more of constrain because it is a direct threat to the freedom to use time. This applies only on the case of the cultures with a polychromic time value.

Not surprisingly, in daring and direct cultures with a low focus on hierarchy and the wielding of authority and power, the individual's acceptance towards technology shall be in direct nexus with one's own subjective norms and behavioral intention [21]. This is less likely to happen in the case of power driven cultures, where hierarchy is truly important and where there is direct pressure from those wielding power to acceptance or reject certain types of technology. In this type of culture, people are not allowed to disagree with their superiors and with those holding authority. They rely entirely on the opinions of those that control both authority and power. In this couple of paradigm we took the view point in which we considered power as a moderator of acceptance. Further continuing this argument, in authoritarian cultures the level of acceptance towards technology is severely smaller than the one in liberal societies. Technology is a threat towards hierarchy. Even the access towards technology constitutes a means to create inequality between those holding power and those that know its lack.

The main feature of the world is that it is apparent filled with a sense of security and stability. The level of acceptance towards technology depends on the existence of unquestioned and unquestionable values. The appearance of new information systems and technology constantly confronts the individual. A state of crisis appears manifested by the destruction of security and stability. By investigating the theories of acceptance we have the chance to understand what happens in that moment of crisis. That is the moment in which stability and instability interact. It results into a cultural whirl that authors of acceptance theories come to consider their task to represent. We cannot help but notice that the cultural and the heritage of a person play an important part in the acceptance of technology, be it hardware or software. There are people that incorporate technology in their heritage, or the heritage in the technology, possible aware of the proper amount of given and known information. And there are people incapable of decoding the information systems and technology appropriately. Accepting technology testifies to the level of confirmation or refusing of other cultures, both in terms of ideas and techniques. Expectations are being either challenged or satisfied.

III. METHODOLOGY

We have organized three interviews and we gathered the data based on the job of the participant: Participant 1 – Technical Consulate, Participant 2 – Product Manager, Participant 3 – Business Analyst. During the interviews, we focused upon Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude Towards Usage (ATU) and Intention to Use (ITU). At this point it is important to note that deductive coding have been developed before examining the actual data, while inductive coding were the result of analyzing the data. Our analysis has focused on three methods: descriptive, thematic and analytic. The descriptive method has merely pointed out the attributes of the source. We are dealing with interviews that are taken on persons that have information and experience with the process of implementing information systems. We have identified several themes that together make up the thematic method of our research, as well as an analytic part that focuses on what is actually going on and how we interpret the data. We manage to capture the interpersonal relationships that are present in this context. We have chosen to employ a qualitative research design because the context is inherently created out of social experiences. Exploring these issues through the use of qualitative instruments allows us to

understand the process from both its human individual perspective and its social perspective. The methodology was inspired from McClelland and Fine [22]. The main reason for using this method was our intention to recognize the experience and knowledge of the participants. Through the use of in-depth interviews, we aimed to understand the meaning of participants' experiences and life [23]. In-depth interviews are used to investigate and check an insider's understanding and to compare the researcher's results, experiences, attitudes and perceptions with that of the participant [24]. In our research, the researcher may be considered an insider because the issue is related with the researcher. Using this method to capture the participant's verbal as well as non-verbal expressions. Questions were open-ended in order to obtain participant's personal views and voices. Though qualitative analysis are much more insightful than quantitative methodologies [25], the methodological limitations of a study based on in depth interviews must also be mentioned. Among them, the most significant ones are the relatively reduced number of respondents and the personal, subjective character of the collected data. Another limit of the research is the subject bias of the participants. This time we managed to avoid the risk of subject bias by not recruiting respondents from risky disciplines such as social sciences and humanities.

IV. DATA MANAGEMENT & ANALYSIS

The data gathered during the interview was imported into NVivo software (NVivo, version 8) in order for us to perform thematic analysis. The principal investigator collected the data. The principal investigator has prior experience in qualitative data coding.

During the interview we managed to code two themes that constantly appeared in the dialogue with these professionals. The first theme we coded under the name "operational challenges", while the second theme was coded with the name "technical challenges". In the first of these the emphasis was on the contribution of communication to the implementation of the information system. Surprisingly is the fact that each of the participants actually displayed a personal attitude towards the entire process of implementing an information system, but each managed to focus on his person while keeping his language well within the paradigm of praise towards the role of the entire team that would handle such a process. Interestingly enough is that even when the participant envisions his own contribution and is seemingly able to underline his own contribution, his language and the words he uses continue to be in nexus with the organization and continue to focus on problems such as bad communication and unclear requirements. The differences in speech patterns are irrelevant when comparing the participants, although those in the Participant 1 category seem to be more personally motivated than the others. The focus of all the participants is on the role of processes, how the new procedure functions and how it relates to those around it, taking also in consideration the market pressure. All of the participants identified the rapid development in software as a major problem. It is insufficient to examine processes without going even deeper in the concepts that are in dependency with this prime theme such as organization, process characteristics and development. To all the persons that were interviewed the term "organization" is more than just familiar. But "development" is strongly associated with the implementation of information systems and with the act of "working", "processing" and "unity". For the purpose of their formal training all the participants are truly struggling to create an efficient procedure because another major problem was delayed project delivery. In most replies the organization is regarded as an inevitable outcome of processes, development, unity and work. This is the essential reason why the participants feel more or less compelled to discuss the organization, the team, the crew and not themselves as individuals when addressing the main challenges for operational challenges paradigm: bad communication, unclear requirements, delayed project delivery and market pressure. When considering the second paradigm, that of technical challenges, they acknowledge the presence and role of the organization that in turn distorts or stunts the autonomous manifestation of their own achievements. By not recognizing the personal capacities of the individual, the organization that implements the information system may create another problem: not knowing the programming expertise of your individuals and this might result into the problem of a technical nature. The significant change brought about by the new implementation of an information system will need to be supported by quality control and constant debugging. There is substantial evidence to show that each participant considers that many weaknesses of the process that is implemented are totally or partially fixed through the presence of a team and a unified organization that focuses on knowing the technical aspect, as well as the security aspects of implementing an information system. We observe that vis-a-vis the processes there is no a priori position as to the long-term inevitability of success, or to the significance of this new procedure. The participants are interested in the results in the long run and they follow the vision of the company or their own.

V. LIMITATIONS

Besides the limitations that are inherent to the qualitative research design we took into consideration the fact that a researcher is in constant danger to get caught in the coding trap, as a result of the fact that we used NVivo. Furthermore, the actual fact that we have employed NVivo can result into a certain distancing of the researcher from the data gathered. Another important danger was the real possibility to identify references to phrases but without being able to discern different contexts. Another challenge was represented by the simple fact

that interview data has a subjective nature and that there are no standards used to process coding or in extracting themes.

VI. CONCLUSION

- The importance of team performance in the implementation of the information system.
- The danger of the capacity of the individual to be limited by top management that is unable to understand the technical possibilities and know-how of the employee.
- Technical problems appear not as much as a result of the lack of expertise, but as a lack in choosing the right employee for the right task.
- There is a growing focus upon communication and perception, abstract results, than on the economic results. The need for instruments able to evaluate the final efficacy of the system based on more abstract indicators.
- The need to balance economic expenditure during the setting up process, but little concern for this aspect during the process of meeting the needs of the client. The needs of the client are above all else.

Our research has been conducted in order to identify the elements that should be taken into consideration when implementing an information system in order to gain and maintain potential for business and market development. Going beyond the general into the deep social network applications we have built our research around the case study of several specialists that identified the major concerns that have a negative effect upon the implementation of information systems. This identification was the result of in-depth interviews that were designed in concordance with TAM. We are confident that our research will help to understand how to manage the relationship between the customer's local cultural preferences and the need of the developer to expand both his audience and his profits, while keeping costs of investment low.

At this point in our research we come to discover that the nature of technology and the nature of the cultural value system implies the need for continued research into this field. Future research is needed. We believe that the complexity of this theme would presuppose the need for inter-disciplinary research, as well as comparative research between communities within the national territory, between nations within the same geographic area and between countries separated by space and geography. In order to accurately predict evolutions and anticipated how technology would be better suited for the needs of the user and how this can be done within an economically sound and profitable environment involves both qualitative and quantitative research. In the future, we plan to expand my research model upon other important stakeholders such as top management, owners, users and political officials. Besides expanding the research in terms of demographic information, rural versus urban, female versus male, age differences, in order to anticipate trends, we believe it is important to incorporate different stakeholders and different indicators.

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