

Models with a social perspective for the management of digital inclusion processes

Jheimer Julián Sepúlveda López¹, Luz Arabany Ramírez Castañeda², José Ismael Peña Reyes³

¹Universidad Nacional de Colombia, Sede Manizales,
Colombia

² Universidad Nacional de Colombia, Sede Manizales,
Colombia

³ Universidad Nacional de Colombia, Sede Bogotá,
Colombia

Abstract: The information and communication technologies (ICT) are tools that are used, expecting to improve the life quality of the communities, as well as their individuals. There are programs and projects that are carried out by using these tools, in order to approach this type of technologies to the underprivileged communities, being this phenomenon labeled as digital inclusion. In this paper, there was performed a revision of diverse models for the management of digital inclusion processes, that propose in their concepts, the use of variables, elements and relations, that go further the quantitative and demographic aspects, and that are focused in the social perspective of this phenomenon. A primary conclusion could be that the models are focused on the users; since most of these models perform a revision of the expectations and perceptions, that communities have about the new technologies or tools, that they want to use with the purpose of improving their life quality, as well as their participation in society.

Keywords: digital inclusion, digital gap, social perspective, management models.

1. Introduction

The information and communication technologies (ICT) are tools that are used to improve the life quality of people. There are programs and projects released by government and private organizations, that use these tools in order to approach this type of technologies, to the underprivileged population. This phenomenon is known as digital inclusion.

The purpose of the digital inclusion is to finish with the digital gap, which has been described as the difference that there is, between the people with access to ICT and the people with no access to these technologies [1]. The digital gap is a complex and multidimensional phenomenon, as well as the digital inclusion, since it exposes evolution and adaptation processes.

There are several kinds of digital gaps, as a result of the change related to the access of the information and communication product, for example: the access gap, which is focused on the difference between the people who have access to ICT and people who do not have this access; the use gap, which considers the difference between people who have access to ICT but are not users; and the quality of use gap, which analyses the difference between the participation of people who have access to ICT and the users of it [2].

Nevertheless, it could be stated that, the researches that have been carried out about the digital inclusion phenomenon, have been not very numerous, since these researches do not consider factors beyond the access gap, or to approach these technological tools to people who do not have them yet. It could be noted that the “*current research about the digital gap has been focused mainly on the first type of gap*” [1], [3], [4].

In this paper, it is performed a revision of the current diverse models, to manage processes of digital inclusion, that propose in their concepts, the use of variables elements and relations that go further the quantitative factors, and that are focused on the social perspective of the phenomenon.

This paper is structured as follows: first, there is an explanation about the revision process that was carried out, to identify the diverse types of models there are for digital inclusion; second, there is a revision of these models based on the concepts of the authors; and third, there is a conclusion where it is appointed, if the models overcome the dimension that is purely quantitative and demographic, of the digital inclusion phenomenon.

2. Systemic revision of the literature about models for digital inclusion

During the development of the state of the art of the digital gap and digital inclusion, in the doctorate thesis "Social perspective of the digital gap: an approaching from complexity" of the National University of Colombia, there was a search of theories appointed by the *Association For Information Systems* (AIS) as the

most widely used, for the research on information systems and the relation with the use of ICT. This systemic search was performed in the Scopus, Web of Science and Science Direct data bases, by following this equation:

"Name of the theory" AND (digital inclusion OR digital gap OR digital divide OR inclusion)

The search in Scopus and Web of Science, was performed focusing on the title, abstract and key words; whereas in Science Direct, it was performed focusing on the whole text of the papers. The purpose of this systemic search of information, was to identify those theories that were used, to tackle the phenomenon of digital inclusion. The results of this search are displayed in table 1.

Table 1: Research theories on Information Systems according to AIS

Theory	# Papers
Absorptive capacity theory	0
Actor network theory	21
Adaptive structuration theory	3
Agency theory	8
Argumentation theory	1
Behavioral decision theory	0
Boundary object theory	0
Chaos theory	2
Cognitive dissonance theory	2
Cognitive fit theory	1
Cognitive load theory	6
Competitive strategy	13
Complexity theory	2
Contingency theory	6
Critical realism theory	0
Critical social theory	2
Customer Focus Theory	0
Diffusion of innovations theory	40
Dynamic capabilities	5
Elaboration likelihood model	2
Embodied social presence theory	0
Equity theory	0
Evolutionary theory	1
Expectation confirmation theory	2
Feminism theory	0
Fit-Viability theory	0
Flow theory	2
Game theory	9
Garbage can theory	0
General systems theory	1
General deterrence theory	0
Hermeneutics	7
Illusion of control	1
Information processing theory	4
Institutional theory	19

International information systems theory	0
Keller's Motivational Model	0
Knowledge-based theory of the firm	0
Language action perspective	0
Lemon Market Theory	0
Management fashion theory	0
Media richness theory	6
Media synchronicity theory	1
Multi-attribute utility theory	0
Organizational culture theory	0
Organizational information processing theory	0
Organizational knowledge creation	1
Organizational learning theory	0
Portfolio theory	0
Process virtualization theory	0
Prospect theory	3
Punctuated equilibrium theory	0
Real options theory	1
Resource-based view of the firm	3
Resource dependency theory	1
Self-efficacy theory	9
Social capital theory	9
Social cognitive theory	62
Social exchange theory	3
Social learning theory	11
Social network theory	5
Social shaping of technology	6
Socio-technical theory	2
Stakeholder theory	6
Structuration theory	7
Task closure theory	0
Task-technology fit	6
Technological frames of reference	0
Technology acceptance model	121
Technology-organization-environment framework	2
Theory of collective action	1
Theory of planned behavior	52
Theory of reasoned action	43
Transaction cost economics	2
Transactive memory theory	0
Unified theory of acceptance and use of technology	39

Usage control model	0
Work systems theory	0
Yield shift theory of satisfaction	0

Source: Prepared by the authors

The revision of the material that was found, allowed to identify some models and theories, that have been used to manage the phenomenon of digital inclusion and in some cases, it was useful also, as a means of assessment of the impact that these programs and projects have. It is also mentioned in the material that was reviewed, that the assessments measure other additional factors for the access of ICT tools.

3. Models to manage digital inclusion processes

The models that have been selected for their description and analysis, will be referred hereunder. These models consider social factors, such as the perspective of the users/beneficiaries:

One of the most used models currently, to review the appropriation of technology, is the **Technology Acceptance Model –TAM**. This model is used with the purpose of assessing the factors, that determine the acceptance and adoption of technologies by people [5]. For this purpose, the TAM model uses variables of the Theory of the Reasoned Action, in order to explain how do individuals (personally and voluntarily) use ICT [6]. The scheme of this model is showed in figure 1.

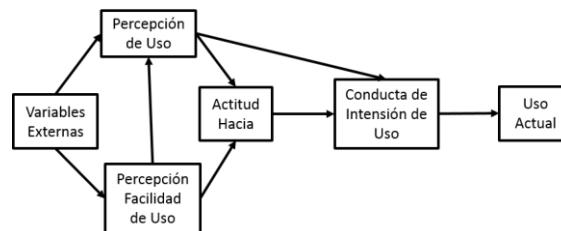


Figure 1: Technology Acceptance Model – TAM defined by Davis - 1989

Source: [7]

This model considers the perception of the user, that uses the new ICT tool. This perception takes into account, the benefits that technology provides and also, how easy the user can handle this product. Besides, there are included in this model, external variables that may affect positively or negatively, the perception of the user. Through this model, it is expected to understand how these perceptions have an influence, in the intention of use by the users, as well as understanding, how this intention of use can become into a habit, which is a factor labeled as "current use".

Though the model is highly used in research processes, there is a constraint: The TAM model can be only applied in situations, where the use of the ICT tool is voluntary [8]–[11]. However, this characteristic that is described by the authors as a constraint of the model, is interesting for this revision, since the purpose is to expose the social perspective: involving factors of the communities, as an active component in the phenomenon of digital inclusion, considering that every community and individual in it, is free to decide whereas making part or not of the process.

The **Appropriation Model** displayed in figure 2 is composed by five factors, that according to the authors, make and must be considered, when understanding the appropriation of the ICT by an specific community.

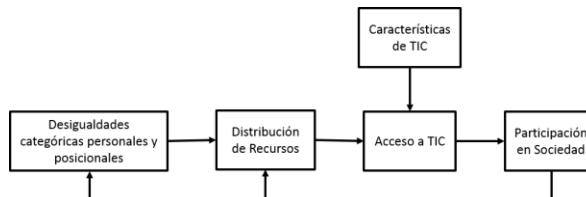


Figure 2: Causal Model of Resources and Appropriation Theory

Source: [12]

In this model, van Dijk classifies the disparities in two groups: personal disparities, that include factors such as: age, genre, race, intelligence, personality and health; and categorical position disparities, that include working position, education, home and nation.

Likewise, the resources of access to ICT are listed below in five groups:

- *Temporary*: having time available to use the digital media.
- *Material*: possessions and incomes.
- *Mental*: technical skills and motivation.
- *Social*: having a social network to assist them in the use of digital media.
- *Cultural*: status and preference of being in the digital media world.

A relevant aspect of this model is that, it includes the characteristics of the ICT, as an important element for the processes of digital inclusion, and for the appropriation of these tools.

The **Heuristic Dynamic Digital Inclusion Model**, also known as **2Id** (figure 3) is a model that provides a basic structure, to allow the researchers conforming and configuring a net of factors, that may influence in the process of social inclusion, through the technological tools [13].

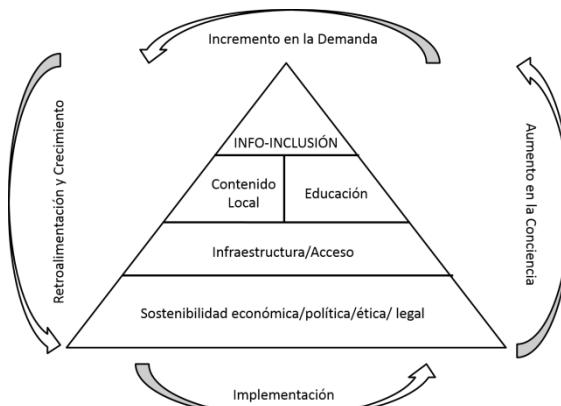


Figure 3: Heuristic Dynamic Digital Inclusion Model – 2iD

Source: [13]

As shown in figure 3, the 2Id model is composed by a feedback cycle, that according to the authors, includes the factors that conform the digital inclusion, which are: economical, political, ethical, legal, access, infrastructure, education and local content. These factors generate a proper environment for info-inclusion. The former term, according to Teles and Joia (2010) corresponds to digital inclusion, by stating that this inclusion is composed by:

- Economical, political ethical, and legal sustainability of the process.
- Existence of physical infrastructure and accessibility to computers and internet.
- Existence of the content and/or adaptation of local production for local consumption.
- Education towards the autonomy of individuals, and their capability to take advantage of the opportunities provided by the information society.

These conditions must connect dynamically to the following stages of a virtuous cycle of participation and empowering:

- Implementation of information tools.
- The raise of awareness of users regarding the possibilities of IT use.
- The higher demand of IT and apps.
- Information about the process, based on the aforementioned, with a significant growth in the number of new participants, and in the number of citizens and strengthening of the people already involved in it.

The 2Id model has a constraint, since it does not consider on its first version the dynamic factor: (multiple relations and elements) of the digital inclusion phenomenon. For this reason, the authors Teles and Joia (2010) restructured the model and named it **Heuristic 2iD Digital Inclusion Model – 2iDj** (figure 4). This model is composed by the same elements of the 2iD model, with a difference in the existent relations among the groups of factors. The relevance of this new type of representation is the dynamism of the factors, besides showing how do each one of them guide the user, to refer and to be interested in the rest of people. This

configuration makes of this model a "complex system of relations", where a minimal change in one of the factors, might have a great impact in all of the phenomenon [13].

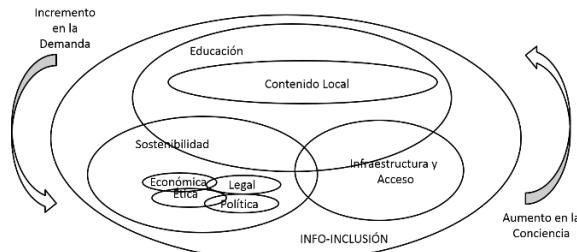


Figure 4:2 – Heuristic 2iD digital inclusion model - 2iDj

Source: [13]

One of the most meaningful aspects of the new model is that, the local content is not independent of the education system, being a proposal that pretends to include people from an early age and to make possible the creation of proposals to solve problems by using the ICT, departing from the traditional education system.

The **e-Government Adoption Model – GAM** (figure 5), is a model that is related to the processes of electronic government or on-line government, which allows identifying common factors with the other models, as well as variables and aspects, that conform an appropriation process of the ICT tools. Some of the aspects that the GAM model considers are: the use skills, the information quality and the functional benefit.

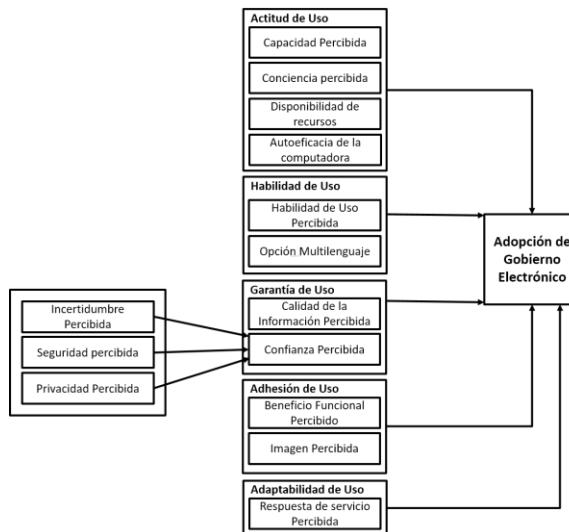


Figure 5: e-Government Adoption Model - GAM

Source: [14]

A constraint of this model, is its particular focus in this type of information systems for the electronic government. The GAM model aims to the revision and identification of individual characteristics, that could determine if the app or tool of electronic government will, or will not be used.

The GAM model highlights the former perception of the users about the phenomenon/process (uncertainty, security and privacy), in order to review later, the diverse attitudes, skills and expectations, that these users are expected to have and that the ICT tool is supposed to fulfill.

The **Activity Process Model** was established based on the principles of the activity theory. This model is considered as a basic reference, in order to establish and describe the activities that are analyzed. In this model, there are included variables and factors, that are related with the systems and the phenomenon of digital inclusion. This characteristic can be seen in figure 6.

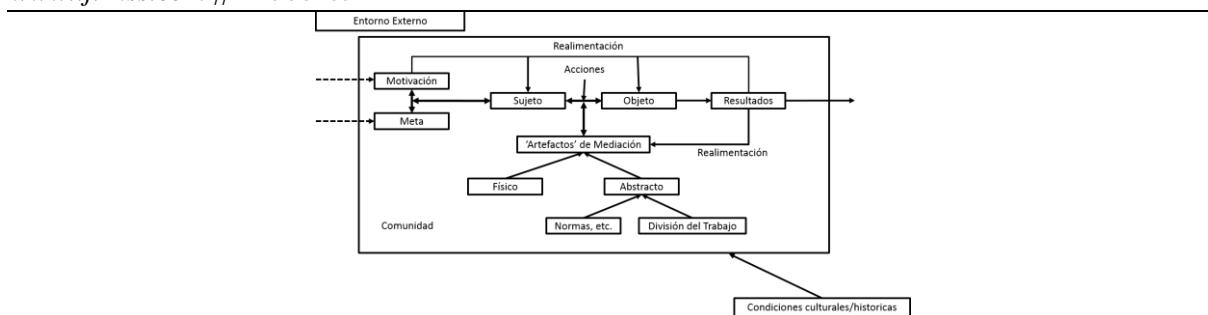


Figure 6: Activity Process Model

Source: [15]

This model is focused in a community, considering the external context, which consists of those characteristics that might affect the digital inclusion process. It comprises as a basic aspect, the motivation and purposes that want to be accomplished with every activity.

To apply this model, there must be established the regulations and laws, that must rule the program-project, as well as the skills and resources that are required for it. This model allows defining in each one of the displayed factors in figure 6, the characteristics that must be considered for the appropriation of the technological tool, by identifying criteria that allow upbringing the tension and contradiction areas.

The **Unified Theory of Acceptance and Use of Technology (UTAUT)** provides an identification of the individual aspects, that influence the intention of use or current use of the ICT tools (figure 7). This is a multidisciplinary model [6], [16], [17]: The UTAUT model is structured based on the diverse aspects of models and theories as: *Theory of Reasoned Action (TRA)*, *Technology Acceptance Model (TAM)*, *Motivational Model (MM)*, *Theory of Planned Behavior (TPB)*, *Model of PC Utilization (MPTU)*, *Innovation Diffusion Theory (IDT)* and *Social Cognitive Theory (SCT)*.

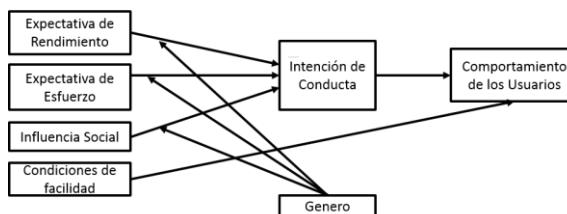


Figure 7:3 Model UTAUT

Source: [6]

As shown in figure 7, the factors that conform the UTAUT model are: the performance expectation, the effort expectation, the social influence and the conditions of easy use. According to the academic papers, it is possible to state that this model has a good performance, to understand the adoption of technologies in the developing countries. Considering again the purpose of this paper, it is important to review the "social influence" factor, as a characteristic that has been appointed as a crucial factor, not only for the adoption and appropriation of a technological tool, but also for the active participation of the people in a community, involved with the programs/projects, that are carried out for the sake of their development.

The **Multifaceted Dynamic Model of the Digital Divide** (figure 8) is designed with the purpose of analyzing the disparities that exist in the information society. Likewise, it allows considering the multidimensional factor of the access to the ICT tools, which described as:

"The multidimensional concept of access is quite complex, which makes it difficult to estimate the effects of differences in access. Reducing this complexity will often be necessary. The analysis of the models of access indicates that it is best to use digital skill as an indicator if a single indicator of access needs to be taken into account. The outcomes from testing the two models also hold social policy implications, since they indicate where to start if people are not on line" [18].

This concept reinforces some aspects already mentioned in this paper; and also, the intention of thinking about the access to these tools, beyond the sole physical access, and going towards the necessary skills for its use.

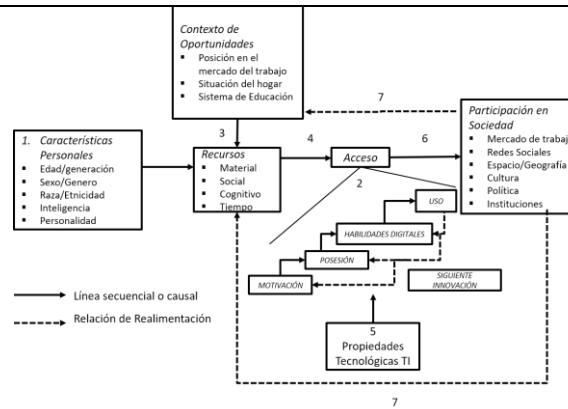


Figure 8:4 Multifaceted Dynamic Model of the Digital Divide

Source: [18]

Initially, this model considers the personal characteristics and their direct relation with the necessary resources, not only of a material kind, but of a social, cognitive and time kind. These resources are also constrained by an opportunity context, which are the factors related to the job, home and education characteristics. From this model, it is possible to highlight several factors:

- The access is divided into several parts, starting by motivation, possession, digital skills and use.
- The properties of the technological tools are included as a relevant factor in a technology appropriation process.
- It is established as an implicit cycle, a cycle composed by resources, the access and the participation in society. The opportunities that are present are integrated with the context, as a means to establish the resources, and to identify the participation of the user in the society (feedback process).

The **Framework of Technology Diffusion** showed in figure 9, is based on the principles of the Adaptive Structuration Theory¹, and pretends to identify the role of technology from an integral vision.

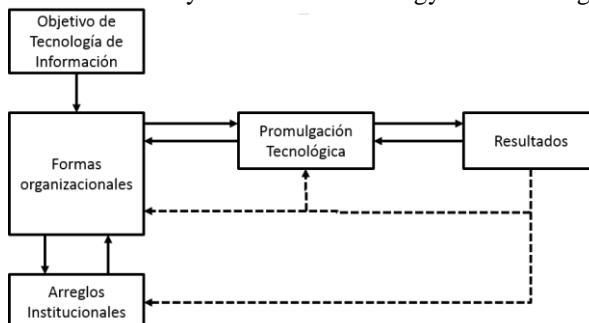


Figure 9:5 Framework of Technology Diffusion

Source: [19]

The purpose of this model is explaining the effects, that the types of organization and the institutional management have on the technological tools, being used by the government agencies.

Through this model, it has been possible to identify that the social, cultural, cognitive and institutional structures have a strong influence in the design, perception, application and use of the ICT tools; besides, the importance of the nets and relations in the diffusion process of this type of tools [19].

The aforementioned is important for this paper, since it has been established that in this type of phenomenon (digital inclusion) there are or there must be considered, not only the individual/personal factors, but also the social characteristics, which are constrained and ruled by social structures.

The model in figure 10 named **Use Model MDSA** - Mobile Data Services and Applications – is used as a basic reference, to identify the factors that are more important for the users, when using this type of services.

¹ It shows how the individuals and organizations are transformed under particular social conditions

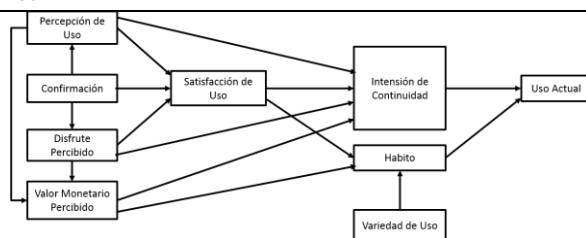


Figure 10:6 Use Model MDSA

Source: [20]

This model is structured in some areas with elements of the Cognitive Dissonance Theory², which is based on the analysis of expectations that the user has, before adopting a technology and on the comparison with the results obtained after the adoption process.

Through the application of this model, it has been possible to identify that the perceived value, the satisfaction of the user and its variety, are key factors to train the habit of using mobile services and apps [20]. The **Framework of Corporate Technological Adoption** in figure 11, shows factors that must be considered, in order to understand the phenomenon of the ICT adoption in the organizations.

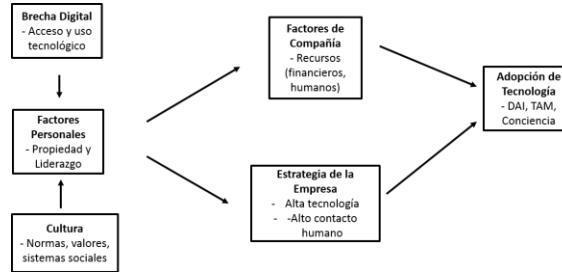


Figure 11: Framework of Corporate Technological Adoption

Source: [21]

In this reference framework, there can be found some factors proper of the digital gap and of the culture, as relevant elements in the personal field of adoption (Leader or Owner), complemented by the strategy and corporate factors. This is important, to take the ICT adoption model in an integral way, allowing to relate the factors that influence in the access, to the tools to be imposed or implemented in the organization.

4. Models to manage processes of digital inclusion: importance of the social perspective

The revision that was performed, had the purpose of not only identifying the models used to manage the processes of digital inclusion, but also, highlighting the diverse factors that must be considered, when structuring these models. The revision of diverse models, allows identifying that the phenomenon of digital inclusion is composed by heterogeneous elements, from individual factors to group and cultural characteristics. One of the most relevant factors, as a result from the revision of these models, is the fact that shows that, most of these models include a factor, that is not very considered for revision in the practical processes of inclusion and digital gap: the perception of the users/beneficiaries.

Each one of the models use this factor in a different way:

- TAM:
 - Use perception
 - Easy use perception
 - Attitude towards it
- Appropriation model
 - ICT access
 - Cultural factors: status and preference for being in the digital media world
 - Mental aspects: technical skills and motivation
- GAM
 - Perceived uncertainty
 - Perceived security

² Theory that studies how people search for internal consistence; consistence among their beliefs, values and others.

- Perceived privacy
- UTAUT
 - Performance expectation
 - Effort expectation
- Multifaceted Dynamic Model of the Digital Divide
 - Motivation
- Use model of MDSA
 - Use perception
 - Perceived enjoyment
 - Perceived monetary value

Besides the perception factor, which is already relevant in the digital inclusion phenomenon, it is worth noting that these models, do not only consider the perception/expectation as an important factor, but also, that they are the access to diverse models. The perception and the expectation, is the first thing that these authors state as a "must be" reviewed, before starting with the processes for digital inclusion, in order to ensure a good technological appropriation process.

5. Conclusions

When discussing about digital gap and inclusion gap, it was found that most of the authors and people interested about these phenomena, explain them regarding the access that people have to ICT, i.e. an approaching focused on the tool as the solution to social problems.

However, the systemic revision that was performed of the literature, allowed identifying a series of models for digital inclusion, that consider factors that go beyond the purely quantitative and technological factors, found repeatedly when reviewing this phenomenon.

There are two relevant conclusions of this model revision for the digital inclusion:

The first conclusion is that, the models are focused on the users. Most of these models perform, before any other process, a revision of the expectations and perceptions that the communities have, about the new technologies or tools to be implemented, with the purpose of improving their life quality and improving their participation in society.

The second conclusion is based on a factor, that only one of the models specifies, which is the importance of the social influence in the ICT appropriation processes. The UTAUT model involves this factor as an access factor; however, it is worth noting that, though they are not explicit on this area, the other models consider social characteristics that lead to establish, that not only the social condition influences in the processes of digital inclusion, but also in the present relations among the diverse users.

6. References

- [1]. J. A. G. M. van Dijk, "Digital divide research, achievements and shortcomings," *Poetics*, vol. 34, no. 4–5, pp. 221–235, 2006.
- [2]. J. M. González Zabala, M. P., & Sánchez Torres, "Análisis de las estrategias del Gobierno colombiano para la inclusión de los ciudadanos en la Sociedad de la Información propuestas desde 2000 hasta 2011," *Rev. Estud. Soc.*, pp. 133–146, 2013.
- [3]. P. B. Brandtzaeg, J. Heim, and A. Karahasanovic, "Understanding the new digital divide-A typology of Internet users in Europe," *Int. J. Hum. Comput. Stud.*, vol. 69, no. 3, pp. 123–138, Mar. 2011.
- [4]. E. Hargittai, "Second-level digital divide: Differences in people's online skills," *First Monday*, vol. 7, no. 4, 2002.
- [5]. A. N. Eagleman, "Acceptance, motivations, and usage of social media as a marketing communications tool amongst employees of sport national governing bodies," *Sport Manag. Rev.*, vol. 16, no. 4, pp. 488–497, 2013.
- [6]. B. Gupta, S. Dasgupta, and A. Gupta, "Adoption of {ICT} in a government organization in a developing country: An empirical study," *J. Strateg. Inf. Syst.*, vol. 17, no. 2, pp. 140–154, 2008.
- [7]. Park, "An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use e-Learning," *Educ. Technol. Soc.*, pp. 150–162, 2009.
- [8]. X. Zhang, "Income disparity and digital divide: The Internet Consumption Model and cross-country empirical research," *Telecomm. Policy*, vol. 37, no. 6–7, pp. 515–529, 2013.
- [9]. P. Verdegem and L. De Marez, "Rethinking determinants of {ICT} acceptance: Towards an integrated and comprehensive overview," *Technovation*, vol. 31, no. 8, pp. 411–423, 2011.
- [10]. Z. Deng, X. Mo, and S. Liu, "Comparison of the middle-aged and older users' adoption of mobile

-
- health services in China," *Int. J. Med. Inform.*, vol. 83, no. 3, pp. 210–224, 2014.
- [11]. S. Taipale, "The use of e-government services and the Internet: The role of socio-demographic, economic and geographical predictors," *Telecomm. Policy*, vol. 37, no. 4–5, pp. 413–422, 2013.
- [12]. G. Ragnedda, M., & Muschert, "The Digital Divide - The Internet and social inequality in international perspective," *ROUTLEDGE Adv. Sociol.*, 2013.
- [13]. L. A. Teles, A., & Joia, "Assessment of digital inclusion via the actor-network theory: The case of the Brazilian municipality of Piraí," *Telemat. Informatics*, pp. 1–13, 2010.
- [14]. M. A. Shareef, V. Kumar, U. Kumar, and Y. K. Dwivedi, "e-Government Adoption Model (GAM): Differing service maturity levels," *Gov. Inf. Q.*, vol. 28, no. 1, pp. 17–35, 2011.
- [15]. K. . b Mervyn, A. . Simon, and D. K. . Allen, "Digital inclusion and social inclusion: a tale of two cities," *Inf. Commun. Soc.*, vol. 17, no. 9, pp. 1086–1104, 2014.
- [16]. Y. Hwang, "The moderating effects of gender on e-commerce systems adoption factors: An empirical investigation," *Comput. Human Behav.*, vol. 26, no. 6, pp. 1753–1760, 2010.
- [17]. M. Mäntymäki and J. Salo, "Purchasing behavior in social virtual worlds: An examination of Habbo Hotel," *Int. J. Inf. Manage.*, vol. 33, no. 2, pp. 282–290, 2013.
- [18]. J. DeHann, "A Multifaceted Dynamic Model of The Digital Divide," *IT Soc.*, pp. 66–88, 2004.
- [19]. R. Luna Reyes, L., & Gil Garcia, "Digital government transformation and internet portals: The co-evolution of technology, organizations, and institutions," *Gov. Inf. Q.*, pp. 545–555, 2014.
- [20]. K. Byoungsoo, "The diffusion of mobile data services and applications: Exploring the role of habit and its antecedents," *Telecomm. Policy*, pp. 69–81, 2012.
- [21]. M. Spencer, A., Buhalis, D., & Moital, "A hierarchical model of technology adoption for small owner-managed travel firms: An organizational decision-making and leadership perspective," *Tour. Manag.*, pp. 1195–1208, 2012.

Author Profile



Jheimer Julián Sepúlveda López: PhD (c) in Engineering - Industry and Organizations - Master's Degree in Administration - Information Systems Administrator, National University of Colombia, Manizales Headquarters, Environmental Thought Research Group, line of research in Administration, Organizations and Environmental Complexity



Luz Arabany Ramírez Castañeda: Doctor in Sustainability, Technology and Humanism, Polytechnic University of Catalonia - Master in Environment and Development, National University of Colombia - Systems Engineer, Autonomous University of Manizales. Associate Professor, National University of Colombia, Manizales Headquarters, Research Group on Environmental Thought, line of research in Administration, Organizations and Environmental Complexity.



José Ismael Peña Reyes: Doctor in Management Sciences - Information Systems, University of Grenoble. France - European Master MATIS Information Systems Management, University of Geneva, Switzerland - Systems Engineer. Associate Professor, Dean, Faculty of Engineering, National University of Colombia Bogota Headquarters, Group of Research in Systems and Technologies of Information and Communication in Organizations – GISTIC