



Exploratory Factorial Model of The Use of Mobile Telephony in the COVID-19 Era

Gilberto Bermúdez Ruíz¹, Arturo Sánchez Sánchez², Francisco Espinoza Morales³, Cruz García Lirios^{4*}

¹Universidad Anahuac,
Mexico City, MEXICO

²Universidad Autónoma de Tlaxcala,
Tlaxcala City, MEXICO

³Universidad de Sonora,
Navojoa City, MEXICO

⁴Universidad Autónoma del Estado de México,
Huehuetoca City, MEXICO

*Corresponding Author

DOI: <https://doi.org/10.30880/ojtp.2022.07.02.004>

Received 20 June 2022; Accepted 15 August 2022; Available online 30 September 2022

Abstract: Internet innovation is an emerging phenomenon in economic crises. In the COVID-19 era, the analysis of new modes of information and communication through devices is the objective of this study. An exploratory, psychometric, and correlational study was carried out with a sample of 187 students from a public university in central Mexico. The results show the prevalence of three factors: usefulness, efficiency, and use of the Internet. In relation to the state of the art, lines of research related to the intensive use of mobile phones are recommended.

Keywords: COVID-19, factorial analysis, model

1. Introduction

The Internet connection from root servers, the United States, Japan, Holland and Sweden are the main nodes. Japan is the nation with the highest connection speed (61.0 mbps), Sweden ranks fourth (18.2 mbps), Holland is sixth (8.8 mbps) and the United States occupies tenth place (4.8 mbps) (Carreón et al., 2019). The economic, technological and social consequences of globalization are described to propose the Theory of Mobile Consumption that explains the consumption of products and services through mobile telephony.

From this panorama it is necessary to investigate the impact of the use of technologies, devices and electronic networks based on the management, production and transfer of knowledge focused on the optimization of resources and the innovation of processes. In the first case, the codification of knowledge implies the concatenation of objectives, tasks and goals. In the second aspect, process innovation suggests the establishment of an agenda focused on the inheritance of knowledge and learning of training styles.

A model is presented in which it is included and demonstrates that the perception of utility is the determinant of the use of mobile Internet (Carreón et al., 2019). Based on the above scenario, it is proposed that individuals, being immersed in information communication flows and networks, become potential consumers when acquiring a mobile phone.

*Corresponding author: cgarciali@uaemex.mx

Precisely, in the following section, the Mobile Consumption Theory (TCM) is explained, which explains the determinants of consumption through a mobile phone (Carreon et al., 2019). The Theory of Mobile Consumption states that individuals carry out their purchases through a mobile phone based on their utilitarian perceptions and purchase decisions.

The TCM maintains that people consume basic products and services through the consumption of secondary products (Carreon et al., 2019). Individuals when buying a mobile phone or any product and technological information communication service, are exposed to the consumption of basic products and services that are advertised and sold through the technologies.

Therefore, the TCM argues that it is the perceptions of utility, innovation and efficiency that determine the consumption of products and services that are advertised and sold through the mobile phone (García et al., 2018). TCM provides the indirect effect of perception of a technological innovation on the consumption of products and services via said mobile technology.

It explains the relationship between ICTs with individuals saturated with multiple activities, people who buy and people who work as supervisors or vendors (García et al., 2019). The TCM predicts the use of the mobile Internet from a cognitive process that begins perceptually and ends behaviorally. From the TCM, the study detailed below was carried out.

The perception of utility is the central axis of the knowledge management agenda because it translates statistical data into meanings of commitment, entrepreneurship and innovation, as well as generates new protocols for information processing whenever the objectives and goals are subject to the climate of tasks, supports and relationships between stakeholders (Hernandez et al., 2019). The TCM raises three explanations of the consumption of products and services through the mobile phone.

The work related to the management, production and transfer of knowledge has focused on entrepreneurship indicated by opportunism, optimization and process innovation (Carreon et al., 2014). This is because it is considered that opportunistic entrepreneurship leads to rational entrepreneurship. It is in this sense that the observation of such a conversion suggests the decomposition and comparison of both emotional and deliberate, opposite and complementary processes.

Opportunism has been widely observed in scenarios of resource shortages, shortages, unhealthiness and lack of public services. It is an informal structure of news and intuitions aimed at subsistence and survival that lead people and groups to organize around trials of successes and mistakes (Elizarraráz et al., 2018).

Opposing opportunism is optimization, which is based on the control and management of resources as a result of knowledge, experience and wisdom (Hernandez & Valencia, 2016). It is an intermediate phenomenon between opportunism and innovation which requires the competition of leaders and talents considered as intangible assets of organizations.

At an extreme opposite of opportunism, process innovation suggests the evolution of technology acceptance, the usefulness of devices and the intensive use of social networks (Hernández et al., 2018). It is true that in these areas' opportunism is in force, but to a lesser extent with respect to the scenarios of development in which it emerges as is the case in the markets on wheels.

Decision-making, focused on the opportunistic entrepreneurial spirit, distances itself from risk and benefit balances, while innovations are based on the balance of costs and benefits, or on the maximization of profits versus minimization. Of losses this is the utilitarianism of entrepreneurship that consists in the emergence of opportunism and the consolidation of innovations, prior to the optimization of resources (Mendoza et al., 2016).

This breakdown is observable in management since the translation of experiences and knowledge implies the opportunism of knowledge translators and promoters of wisdom (Quintero et al., 2016). This is the case of unicorn or startup companies that are designed for exponential growth based on the opportunism of a non-existent product or process in the market.

In the case of the production of knowledge focused on the development and consolidation of systematic reviews and findings of relationships between components of a product or process, opportunism is in force, but to a lesser extent since it is gradually replaced by the optimization of resources (Robles et al., 2016). It is that of the companies that create knowledge that are exposed to reorganize their objectives, protocols and goals in order to survive the dynamics of the market as understood by alliances between micro, small and medium enterprises.

As for the translation of knowledge focused on the learning of knowledge from an academic, professional and occupational training, opportunism remains sighted, but already very oriented towards the discovery of heuristics or procedural shortcuts (Sales et al., 2016). These prolegomons of innovative entrepreneurship are distinguished by their ability to link phases or entities that had not been observed together. Knowledge-creating companies exemplify this type of conversion from opportunism to innovation, mainly observed in the relationships between traditional leaderships regarding emerging talents.

From the theoretical, conceptual and empirical frameworks reviewed, it is possible to notice the trajectories of relations between the dimensions, categories, variables and indicators reported in the specialized and updated literature from 2019 to 2022.

The first emerging and preponderant path refers to the provisions that are aversive or prone to entrepreneurship and that are geared towards the academic, professional and labor training of talents in their process aimed at the conversion

of intangible assets (Sánchez et al., 2018). This issue begins with the formation of academic habitus and culminates with process innovation, mediating entrepreneurial opportunism and resource optimization.

In a second route, the emergence of opportunistic proposals that shapes the unicorn projects of the startups has been observed as a process to inform that it is institutionalized as risk capital increases its responsibilities (Vazquez et al., 2016). This is how the isomorphism that distinguishes innovative companies leads them to become resource optimizing organizations to guarantee profit based on the exploitation of the original idea rather than the commitment to new proposals.

A third route refers to the injection of seed capital to knowledge reproductive projects. It is based on a corporate and isomorphic institutionalization with respect to a matrix (Juarez, 2020). It is the documented case of the oriental companies that based on family traditions grew gradually until they reached the optimization of resources and in the end acquire the innovations and not only reproduce the knowledge of the West.

This is how the objective of the present work was to specify a model for the study of the perception of utility, considering the dimensions that literature contributes with respect to the acceptance of technology, the propensity to information and the motivation for achievement. Based on a review of the literature on the dimensions of mobile Internet use, we proceeded to contrast the hypothesis regarding the significant differences between the atheoretical structure with respect to the empirical observations of the present work.

Do perceptions of the level of utility and the degree of innovation have an indirect, positive and significant effect on the level of use? This paper sets out the theoretical frameworks of utilitarian entrepreneurship regarding the acceptance of technology, risk aversion and perceived utility to explain the entrepreneurship process from the deliberate, planned and systematic rationality of intensive use of technologies, devices and networks. Social (Garcia et al., 2013).

Next, the specialized and updated studies of the state of the question regarding entrepreneurial utilitarianism from the use of electronic technologies, devices and networks are presented, assuming that the decision to carry out the project's undertaking involves the optimization of information, thus as process innovation (Garcia et al., 2015).

In the end, the trajectories of relationships between categories, variables and indicators are specified to observe entrepreneurial utilitarianism and contrast it with opportunism that is an improvised, emotional and intuitive process (Garcia, 2014).

2. Method

Two quantitative, cross-sectional, psychometric and correlational studies were carried out in order to test the null hypothesis of significant differences between the theoretical dimensions of mobile Internet use reported in the literature with respect to the observations of both studies in samples of students in public universities. from central Mexico.

There were 186 students selected from the Metropolitan Autonomous University. 65 men (25 studied in CBI, 26 in CBS and 14 in CSH) and 121 women (22 in CBI, 59 in CBS and 40 in CSH).

In the first phase, the reliability and validity of the instruments that measured the five variables was built and established.

In the second phase, the likelihood of adjusting indirect and direct, negative and positive, and significant causal relationships between the study variables was modeled and demonstrated.

From the Mobile Consumption Theory, twelve indicators were established that configured three dimensions for the five variables of the measurement model that were subjected to a confirmatory factor analysis of the main components with varimax rotation and maximum likelihood (Espinoza et al., 2020). The results reject the hypothesis of factorial unidimensionality for three variables of the measurement model (García & Bustos, 2021).

Scale of the perception of the level of utility. 12 items with response options from “strongly disagree” to “strongly agree”. The table shows the convergence (indicated by the factor weight) of the reagents with respect to the factor (Espinoza et al., 2022).

Scale of the perception of the degree of efficiency. 12 items with response options from “never” to “always”. Considering the factor weights of the perceptual variable of self-efficiency, the convergence of four reagents is demonstrated (Garcia, 2018).

Scale of the level of use. 12 items with response options from “less than ten minutes” to “more than twenty minutes (Jacinto & Lirios, 2022).

The psychometric properties of the instruments that measure the study variables are detailed in the table where they meet the requirements for multivariable analysis (Garcia et al., 2020).

During the first week of the spring quarter of 2022 at the UAM-I library, students were asked how often they used their phone to download images, sounds and speeches to select the ideal sample. Subsequently, the questionnaire was provided indicating a response time of 30 minutes to answer it.

3. Results

From the Innovation Theory, a new model was designed with the variables that met the criteria of reliability and validity (see table 1).

Table 1 - Kaiser Meyer Olkin test

	MSA
Overall MSA	0.783
r1	0.769
r2	0.824
r3	0.782
r4	0.907
r5	0.829
r6	0.725
r7	0.778
r8	0.866
r9	0.742
r10	0.840
r11	0.827
r12	0.804
r13	0.798
r14	0.640
r15	0.485

Source: Elaborated with data study, Bartlett’s test 1783.936 (105 df) $p < .001$

Multiple linear regression was calculated to establish the determinants of the dependent variable and the non-linear relationship between independent variables. The scheme shows that the perception factor of academic utility is the main determinant of the level factor of Internet use for academic purposes (see Table 2).

Table 2 - Factor loadings

	Factor 1	Factor 2	Factor 3	Uniqueness
r1			0.857	0.353
r2	0.521	-0.581		0.407
r3	-0.952			0.153
r4	0.564	-0.587		0.311
r5		-0.481	0.453	0.313
r6		0.605		0.531
r7		-0.966		0.106
r8	0.917			0.194
r9			-0.710	0.312
r10		0.838		0.155
r11	1.023			0.021
r12	-0.887			0.102
r13	0.789	0.573		0.051
r14		0.617		0.427
r15			0.829	0.367

Source: Elaborated with data study,

Note. Applied rotation method is promax. Factor 1 = Utility, Factor 2 = Efficiency, F3 = Use

This finding indicates a modification of the TCM measurement model by proposing a direct, positive and significant effect of the utility factor on the use for academic purposes. That is, a person looking to buy for example a book, could get it if there was a virtual library connected to the mobile phone (see table 3).

Table 3 - Factor correlations

	Factor 1	Factor 2	Factor 3
Factor 1	1.000	0.031	-0.261

Factor 2	0.031	1.000	-0.264
Factor 3	-0.261	-0.264	1.000

Source: Elaborated with data study. Factor 1 = Utility, Factor 2 = Efficiency, F3 = Use

Similar reasoning would imply the perception factor of self-efficiency as a determinant of academic mobile use. An individual looking for academic information could find it through his mobile phone. However, the causal relationship lacking the required significance suggests the exclusion of the variable (see Figure 1).

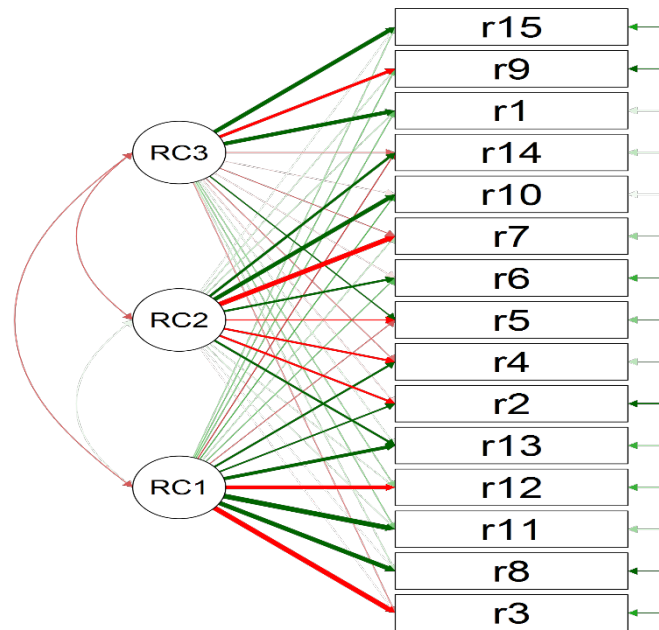


Fig. 1 - Path diagram

Source: Elaborated with data study, χ^2 411.837 (63 df) $p < .001$; TLI = 0,646; RMSEA = 0.248. Factor 1 = Utility, Factor 2 = Efficiency, F3 = Use

The strength of association between independent variables indicates its spurious implication. Finally, the level of mobile Internet use for academic purposes is explained by the two independent variables in percent of their variability. From the original measurement model only two variables maintain a causal relationship that selects them for inclusion in another measurement model. These consequences and implications are discussed below.

4. Discussion

The objective of the present work was to specify a model for the study of the perception of utility, considering the dimensions reported in the literature, as well as those established in the present work, but its design limited the contributions to the analyzed sample, suggesting the extension of work towards other scenarios and other study samples.

In relation to the perception of utility that literature identifies as concomitant to the perceived ease of use (Martínez et al., 2019). The present work has shown that it affects, together with the perception of efficiency, the intensive use of electronic technologies, devices and networks.

Regarding the perception of effectiveness that literature links to the perception of control (Villegas, 2019). The present study has shown that when interrelated with the perception of utility generates a predictive structure of Internet use.

In relation to the use of the Internet, literature stands out as a result of the interrelationship between perceptions of utility, ease, efficiency and control (Villegas et al., 2019). The present work has shown that the perception of utility associated with the perception of effectiveness generates a structure that determines the use of the Internet.

Research lines concerning the associative structure of the perception of utility with the perception of efficiency and these as determinants of the use of the Internet will explain the rational, deliberate, planned and systematic process of acceptance of technology.

5. Conclusion

The objective of this paper was to specify a model based on the theory of mobile consumption, which highlights the relationship between perceptions as determinants of the use of technologies, devices and networks. However, the present work proposed a modification of the perceptual structure in order to increase the predictive power of the theory of mobile consumption, highlighting the association between the perception of utility and the perception of efficacy as predictors of behavior. Research lines concerning the predictive structure of electronic consumption will explain the associative relationship between utility and perceived effectiveness, as well as its impact on the use of the Internet.

References

- Carreon, J. Hernandez, J., Garcia, C. Garcia, E., Rosas, F. & Aguilar, J. (2014). Specifying a digital enterprise model for human development through intensive use of information and communication technologies. *Rural Perspectives*, 13 (25), 123-155
- Carreón, J., Fierro, E. and García, C. (2019). Models of fixed effects of diffuse variables in the formation of intellectual capital. *International Journal of Engineering Research and Development*, 15 (9), 1-7
- Carreón, J., Hernández, TJ and García, C. (2019). Exploratory categorical structure of employment expectations. *Journal of Social Science Research*, 6 (8), 1-6
- Carreón, J., Villegas, E. and García, C. (2019). Model of the determinants of human capital. *International Journal of Advances in Social Science and Humanities*, 7 (8), 1-5
- Elizarraráz, G., Molina, H. D., Quintero, M. L., Sánchez, R. y García, C. (2018): Discursos en torno a la lucidez organizacional en las alianzas estratégicas y las redes de conocimiento entre mipymes caficultoras el centro de México. *Margen*, 89, 1-11
- Espinosa Morales, F., Sánchez Sánchez, A., Hernández Valdés, J., & García Lirios, C. (2020). Scenarios, phases, roles and discourses of internet violence in a higher education institution. *SUMMA. Revista Disciplinaria En Ciencias económicas Y Sociales*, 2(1), 65-82. Recuperado a partir de <https://aunacali.edu.co/revistas/index.php/RDCES/article/view/111>
- Espinoza-Morales, F., Sánchez-Sánchez, A., & García Lirios, C. (2022). Reputación corporativa en una universidad pública formadora de trabajadores sociales de la salud pública. *Revista GEON (Gestión, Organizaciones Y Negocios)*, 9(1), e-747. <https://doi.org/10.22579/23463910.747>
- García Lirios, C. (2014). Actitud hacia la utilidad y el riesgo de las redes sociales. *Folios, Revista De La Facultad De Comunicaciones*, 1(29), 81–93. Recuperado a partir de <https://revistas.udea.edu.co/index.php/folios/article/view/18292>
- García Lirios, C. (2018). Confiabilidad y validez de un instrumento que mide la intención de uso de internet. *Contexto*, 7, 31-37. <https://doi.org/10.18634/ctxj.7v.0i.835>
- García Lirios, C., Bustos Aguayo, J., & Juárez Nájera, M. (2020). Percepción e intención de riesgo ante COVID-19: Risk perception and intention to COVID-19. *Revista De Investigación Académica Sin Frontera: División De Ciencias Económicas Y Sociales*, (34), 1–26. <https://doi.org/10.46589/rdiasf.vi34.317>
- García Lirios, C., Carreón Guillén, J., Hernández Valdés, J., Limón Domínguez, G. A., & Bustos Aguayo, J. M. (2013). Determinantes perceptuales de la intención de uso de Internet para el desarrollo del capital humano. *Fórum Empresarial*, 18(1 Verano), 95–119. <https://doi.org/10.33801/fe.v18i1.3769>
- García Lirios, C., Carreón Guillén, J., Mendoza Alboreida, D., & Aguilar Fuentes, J. A. (2015). Educación e Internet para el desarrollo local. *Revista de Comunicación de la SEECI*, 36, 42–94. <https://doi.org/10.15198/seeci.2015.36.42-94>
- García, C., Espinoza, F. and Carreón, J. (2018). Model of intangible assets and capitals in organizations. *International Journal of Research in Humanities and Social Studies*, 5 (4), 1-12
- García, C., Martínez, E. and Quintero, M. L. (2019). Exploratory factorial structure climate and labor flexibility. *Turns*, 20 (2), 55-72

- García-Lirios, C., & Bustos-Aguayo, J. M. (2021). Diseño y evaluación de un instrumento para medir el uso de internet en la era COVID-19. *Revista CEA*, 7(14), e1665. <https://doi.org/10.22430/24223182.1665>
- Hernandez, A. & Valencia, R. (2016). Innovation instruments: social networks in the internalization of micro, small and medium - sized Mexican companies. In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 47-66). Mexico: Miguel Angel Porrúa-UAEMEX.
- Hernández, J., Anguiano, F., Valdés, O., Limón, G. A. y García, C. (2018). Confiabilidad y validez de una escala que mide las expectativas de formación profesional. *Margen*, 89, 1-13
- Hernández, TJ, Carreón, J. and García, C. (2019). Netizens Millennials. *International Journal of Advances Engineering Research & Science*, 6 (7), 1-5
- Jacinto, O. A. D., & Lirios, C. G. (2022). Digital Activism in the COVID-19 era. *Jurnal Bisnis, Manajemen, Dan Ekonomi*, 3(3), 147 - 155. <https://doi.org/10.47747/jbme.v3i3.768>
- Juárez, M. (2020). Specification a model for study of corporate assistance. *Global Journal Archeology & Anthropology*, 11 (2), 50-54
- Martínez, E., Espinoza, F. and García, C. (2019). Models of the determinants of vocational training. *International Journal in Advances of Social Science and Humanities*, 6 (7), 1-5
- Mendoza, E. Ramirez, L. & Atriano, R. (2016). Use of media and technology in creating an innovation system for the common good. In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 95-114). Mexico: Miguel Angel Porrúa-UAEMEX.
- Quintero, M., Velázquez, E., Sales, J. & Padilla, S. (2016). A review of the state of the art on SMEs. What innovation studies? In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 31-43). Mexico: Miguel Angel Porrúa-UAEMEX.
- Robles, C., Alviter, L., Ortega, A. & Martinez, E. (2016). Culture of quality and innovation in microenterprises. In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 11-30). Mexico: Miguel Angel Porrúa-UAEMEX.
- Sales, J., Quintero, M. Velázquez, E. (2016). Adaptation versus innovation: the formation of industrial districts from rural communities. Santa Cruz Atizapan and Chiconcuac. In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 181-199). Mexico: Miguel Angel Porrúa-UAEMEX.
- Sánchez, A., Hernández, T. J., Martínez, E., Villegas, E. y García, C. (2018). Cultura organizacional en microempresas activadoras del desarrollo local. *Margen*, 89, 1-10
- Vazquez, C., Barrientos, B., Quintero, M. Velázquez, E. (2016). Government support for innovation, technology and training for small and medium enterprises in Mexico. In M, Quintero. Sales, and J. Velázquez, E. (Coord.). *Innovation and technology challenges for practical application in companies*. (Pp. 67-78). Mexico: Miguel Angel Porrúa-UAEMEX
- Villegas, E. (2019). Governance of intellectual capital millennials for the creation intangible organizational values. *Net Journal of Social Science*, 6 (1), 1- 9
- Villegas, E., Carreón, J. and García, C. (2019). Specification a model for study of intellectual capital. *International Journal of Economics and Management Studies*, 10, 1-2