BEST: International Journal of Humanities, Arts, Medicine and Sciences (BEST: IJHAMS)
ISSN (P): 2348-0521, ISSN (E): 2454-4728
Vol. 5, Issue 09, Sep 2017, 33-40

COMPARATIVE OF SIGNIFICANT RELATIONS OF INFORMATION AND COMMUNICATION TECHNOLOGIES INDICATORS AND ASSOCIATED TO WITH HOLDING RATES, COMPLETION RATES, GRADUATION, WORK INTEGRATION, AND SATISFACTION INDICATORS INPUBLIC UNIVERSITIES IN MEXICO

FABIOLA RAMIRO MARENTES[1], JOSÉ LUIS ARCOS VEGA[2],
MANUEL DE JESÚS LARA SALAZAR[3] & MARCELA BARRERAS HERNÁNDEZ[4]

[1,2,4]Universidad Politécnica de Baja California, Calle de la claridad SN,
Col. Plutarco Elías Calles, Mexicali, Baja California, Mexico

[3]Universidad Autónoma de Sinaloa, Prolongación Josefa Ortiz de Domínguez S/N,
Cd Universitaria, Culiacán Rosales, Sinaloa, Mexico

ABSTRACT

Comparative correlation analysis of 2015 and 2017 of information and communication technology indicators and indicators associated with academic results in higher education public institutions. Method: quantitative, non-experimental, cross-sectional, correlative. The objective to compare the significant relations between the indicators of education programs that incorporate the environment telematics and sustainable development in their programs, with indicators of graduation, withholding rates, completion efficiency, work integration, and graduates and employer satisfaction. We analyzed 58 state public universities that presented their Education Quality Strengthening Program of the Ministry of Public Education in 2015 and 2017; these were also processed in the statistical package for social sciences (SPSS), obtaining the correlation coefficients, Pearson *r*. The results showed relations under0.5 on both years.

KEYWORDS: TIC, Academic Results, PFCE, Public Universities & Higher Education

INTRODUCTION

To increase education quality is a priority for Mexico's federal government in order to improve life quality of the population and generate sustainable progress conditions. In order to achieve this, it considers necessary to promote the incorporation of the new information and communication technologies (ICT) in the teaching process (Presidency, 2016). In higher education, specifically in state public universities (UPE), the education quality has been promoted by politics oriented to the acquisition of extraordinary resources in order to improve performance, competing to gain access to them. Through the Ministry of Public Education (SEP), it has used, as the main tool to access these resources, the formulation of Integrated Programs of Institutional Strengthening (PIFI), started in 2001, as part of the public policy in higher education in the country. PIFI is a program coordinated by (SEP) that seeks to promote the continuous improvement of education programs and academic services that public IES offer, through participative planning and continuity in the Program of Quality Strengthening in Education Institutions (PROFOCIE). It is now incorporated into the Program of Education Quality Strengthening (PFCE) (SEP, 2016). A relevant aspect that public politics, consider regarding higher education, is the implementation of ICT, solidifying as a main indicator to measure service quality in evaluations, internal and external, to which the Higher Education Institutions (IES) are subject. With ICT, IES face the challenge of improving education

quality, as well as diversifying and amplifying their education offer. The big potential of ICT has contributed to the federal government allocation of part of its budget into the acquisition, maintenance, and update of computer equipment (Presidency, 2016).

Under this precedent, the research problem arises from the question 'What are the significant relations between ICT indicators and indicators of academic competitiveness of UPE in Mexico, in 2015 and 2017? It is established, as objective, to compare the significant relations of such indicators and their recurrence in the quality of education of bachelor degree programs offered. It begins from the assumption that the incorporation of ICT impact significantly in the academic competitiveness of UPE.

This study considers references of education, politics from UNESCO, SEP, PSE, PFCE, ANUIES; as well as authors that approach the subject like Castillo, Larios, and García (2010), Belloch (2012), Cobo (2009), Amar (2008), Díaz (2010), Herrera (2009), Marqués (2012), and Arredondo, López and Llórenz (2015).

About Information and Communication Technologies

Information and Communication Technologies (ICT) are considered as computing and informatics tools that process, store, synthesize, recover, and present information, represented in the most varied ways. They are a group of tools, support, and channels for treating and accessing information that constitute new support and channels in order to shape, registry, store, and promote informational content. All these technology tools that are used for communication and information processing are known as ICT. They include informatics (television, programs, teleconferences, network, web, or internet along with all its possibilities, and radio); and the audiovisual technology (videos in different formats) (Castillo, Larios, and García, 2010). ICT enable the universal capacity to access and contribute to information, ideas, and knowledge; they are needed to manage and transform information, particularly, the use of computers and programs that allow the creation, modification, storage, protection, and recovery of information; they make possible to promote the exchange and strengthening of world knowledge in favor of development, allowing an equitable access to information for activities in all the knowledge areas, granting access to information in public domains; they generate multiple advantages such as an instructed public, new jobs, innovation, commercial opportunities, and the advancement of sciences (Cobo, 2009). The characteristics that represent ICT are immateriality, interactivity, interconnection, immediacy, elevated parameters of image and sound quality, digitalization, more influence in the processes than in the products, great presence in all sectors, innovation, tendency to automation, and diversity (Belloch, 2012, p. 3).

Information and Communication Technologies in Education

Regarding education, ICT increase quality in the education process, tearing down all barriers of space and time, allowing the interaction and collaboration between people for the collective construction of knowledge, and of quality information sources (collective learning), and the development of individuals thanks to the allowance to such sources. Then, ICT are those devices (hardware and software) that allow the intrapersonal and multidirectional communication and collaboration: editing, producing, storing, exchanging, and transmitting data between different information systems; influencing social relations, organizational structures, methods of teaching-learning, forms of cultural expression, business models, international and national public politics, scientific production, among others (Cobo, 2009).

In Mexico, ICT are an essential component to the strengthening of higher education, transforming its action environment, affecting the communication process and the acquisition of information; opening countless access

possibilities and knowledge generation; having great relevance in the education process, and gradually joining to the task of the Higher Education System. Such is their importance that the education concept has been transformed since its promotion; ICT has allowed a great advance in the access to information, its decoding, storage, transference, update, and comparison; their incursions in the classrooms has greatly modified teaching (Amar, 2008). Their incorporation to higher education complies with their great communication capacity, offers easy access to documental resources, and is part of the daily practices in communication and interaction that young people maintain with their social environment. Their relevant functions rise from the fact that they are a means of expression and multimedia creation; a cannel for communication, collaboration, and exchange; an instrument to process information; an open source of information and resources; a cognitive instrument; an instrument for administrative and tutorial management; a diagnostics instrument; a teaching means; generator of new training scenarios; a ludic way and for the cognitive development, for students and also for teachers and administrative staff (Herrera, 2009; Marqués, 2012, p.7). ICT allow access, production, treatment, and information communication in different codes; text, images, sound, etc.; the most significant elements are the computed and the internet (Belloch, 2012).

The introduction of ICT in classrooms makes obvious the need for a new role definition, especially for teachers and students. The students, thanks to these new tools, can acquire better autonomy and responsibility in the learning process, forcing the teachers out of their classic role as the only knowledge source. This forces the re-adaptation of academic institutions. Nowadays, it is essential to know how to use technologies and that students actively participate in society and enter the labor market. For many young people, the school is still the main space to access knowledge, values, and socialization mechanisms, as well as computers and internet. Therefore, it is a privileged space where efforts must be made regarding public politics so they can achieve significant and quality learning (UNESCO, 2013).

The Communication and Information Technologies and Education Quality

Regarding higher education quality, ICT has contributed to the acquisition of new technology competitions promoting digital literacy; to have new instruments for education tasks; surging from the need of continuous training for teachers; and the creation of a new virtual learning environment (Marqués, 2012).

The incorporation of ICT in education scenarios (Díaz, 2010, p. 147) has been guided more from advancements in technology than from the knowledge emanated from the psychology of learning to moderate by such technologies, or by teaching propositions placed in education contexts supported in them; in order to achieve a quality education, we must impulse the use of ICT to promote superior knowledge, the collaborative knowledge construction, the teaching based on problems solving, and the conduction of personal and social relevance projects. The incorporation of ICT in education requires to make the most of their potential as a cognitive instrument to think, inter-think, and communicate; to quit focusing and them and focus all attention in learning with them, emphasizing the knowledge construction and not only the acquisition of information.

In an international scope, the actions regarding the ICT implementation in higher education are promoted by recommendations issued by organisms like UNESCO, which indicates that the problems to face by IES in the XXI century are, among others, the incorporation and use of ICT in learning-teaching processes (Arredondo, López y Llórenz, 2015). In 1998, the UNESCO recognized the contribution of ICT in the area of higher education. In *World Conference of Higher Education*, held in Paris, in 1998, regarding the potential and the technology challenges, it was pointed out that the

progress in new information technologies and the transmission of knowledge will keep on transforming the elaboration, acquisition, and transmission of the aforementioned, allowing the renovation of courses content and pedagogic methods, and amplifying the access to higher education; and that the IES must make the most of the advantages and the potential of new ICT, procuring the quality and high levels in practices and results of the education they offer (UNESCO, 1998). In the *Quito Declaration regarding the Role of Universities in Information Society*, the potential that new TIC have as support to the modernization of higher *education* are considered, through the promotion of changes in thinking and action paradigms in order to guarantee a bigger and better access to knowledge, improving and amplifying coverage, high quality, and social pertinence *and* it suggests the permanent evaluation of the contribution of these areas in academic processes (UNESCO, 2003).

Regarding Mexico, the Federal Government establishes, as a goal, the achievement of quality education pointing out the need of using ICT effectively as an essential component in this process (SEP, 2013a). In order to strengthen the quality and pertinence of higher education, ICT are considered as a main element that has allowed the expansion of the offer and diversification of education attention models; they are of great use in the processing of information, and recognize that the advancement in their use is still not enough, making it necessary to consider, for its implementation, investments on technology platforms, the review of pertinent rules, the promotion of research regarding the use of technologies and the evaluation of results, the development of the offer of open education and online education, the incorporation of the teaching of new technology resources, the promotion of associated and multidisciplinary research in the use and development of technologies applied to education, to use it in order to train teachers, directives, and support staff that participate in schooled, non-school, and mixed modalities; to facilitate the development of online learning units, to strengthen coordination and monitoring in schools with education programs of mixed and non-schooled modalities, to create programs so schools can have computer, workshop, and laboratory equipments, and internet access, as well as to develop the necessary instruments for its maintenance(SEP, 2013b,p.53). For its part, the National Association of Universities and Higher Education Institutions (ANUIES, 2003) points out that, in order to strengthen the higher education Mexican system, the use of ICT must be supported, allowing continuous and independent learning.

The quality of higher education relies, nowadays, in the evaluation of IES functions; among them is the evaluation of the education institution supported in the PFCE; using as a continuity of PIFI, through this program, the institutions receive extraordinary resources in response to the priorities that derive from a strategy planning exercise made by such education institutions, contemplating institutional indicators associated to the capacity and academic competitiveness, and innovation (PROFOCIE, 2014). Among their indicators, ICT associated indicators are evaluated.

The quality of higher education is a priority for Mexico's Federal Government politic strategy; this leads to observe the significant way in which the acquisition and use of ICT provide to the good performance and competitiveness of IES.

METHOD

This study considers a quantitative analysis, no experimental, cross-sectional, and correlated (Hernández, Fernández and Baptista, 2010). The population in this analysis consists of 58 UPE that submitted, for evaluation, their project Program of Quality Strengthening in Education Institutions (PROFOCIE) and their project Program of Education Quality Strengthening (PFCE)before SEP, and which data corresponded to 2015 and to a projection made by education

institutions in 2017. The data was organized and processed in the Statistical Package for Social Sciences (SPSS), significant relations of indicators were obtained, Pearson *r*, and a comparative analysis of the of the years mentioned was made. For the analysis, we considered the variables: telematics incorporation of the environment and the sustainable development in study programs, and the indicators associated to withholding rates, work integration, completion efficiency, graduation, and satisfaction indicators of graduates and employers, as well as the opinion of society regarding the results of higher education institutions. The information is presented in tables and the relevant aspects are described.

RESULTS

The relation between variables of education programs that incorporate telematics of the environment and sustainable development in their study plans and indicators associated to withholding rates, graduation, completion efficiency, and graduates work integration, as well as the satisfaction indicators of graduates, employers, and society, on UPE in Mexico, in years 2015 and 2017, show no significant relations in both years, and we can observe a decrease in the correlation of indicators analyzed, comparing them to those of 2017 (see *Table 1*).

Table 1: Correlation Matrix. Education Programs that Incorporate Telematics of the Environment and Sustainable Development in their Study Plans and their Relation to Education Programs with Withholding Rates and Work Integration. Comparative 2015 and 2017.

		ICT indicators		
Indicators of Withholding Rates		**Percentage of Education Programs that Incorporate Telematics Del of the Environment and Sustainable Development in their Study Plans**		
		2015	**2017**	**Difference**
Percentage of education programs of senior university technician and associate professional(TSU)and Bachelor degree on withholding rate from 1º. to 2nd. Year higher than 70%.	*r*	0.155	.035	-0.120
Percentage of withholding rate by generational cohort of cycle A; from 1st. to 2nd. year of Bachelor degree.	*r*	0.055	.088	0.033
Percentage of withholding rate by generational cohort of cycle B; from 1st. al 2ndyear of Bachelor degree.	*r*	-0.463	-.050	0.413
Percentage of education programs in which 80% or more graduates got a job in less than six months after graduating.	*r*	0.263	.222	-0.041
Percentage of education programs in which 80% or more graduates carried out a work activity during the first year after graduating, and was related or consistent to their studies.	*r*	0.226	.128	-0.098
Percentage of Bachelor degree graduates that got a job in less than six months after graduating.	*r*	0.253	.217	-0.036

**.Correlation is Significant at Level 0.01 (Bilateral).*. Correlation is Significant at Level 0.05 (Bilateral).

Regarding the relation of education programs that incorporate telematics of the environment and sustainable development in their plans with indicators of completion efficiency and graduation in bachelor degrees, the results do not show significant relations; in 2015,the highest data is located in the relation of the graduates percentage in cycle A with 0.299, the other relations were negative; in 2017,the highest data shows a relation with the indicator of students graduated from Bachelor degrees that carried out any work activity after graduating and was related to their studies, with0.371. In the compared years, the data shows increase in the relation with other indicators, with completion efficiency in cycle A,

it went from 0.299 to 0.325;in cycle B, it went from -0.330 to 0.313(see *Table 2*).

Table 2: Matriz De Correlación. Education Programs that Incorporate Telematics of the Environment and Sustainable Development in their Study Plans and their Relation to Completion Efficiency, Graduation, and Satisfaction of Graduates and Employers. Comparative 2015 and 2017.

		ICT Indicators		
Indicators of Completion Efficiency and Graduation		**Percentage of Education Programs that Incorporate Telematics Del of the Environment and Sustainable Development in their Study Plans**		
		2015	**2017**	**Difference**
Percentage of graduates (completion efficiency) by generational cohort of cycle A; in bachelor degrees	*r*	0.299	0.325*	0.026
Percentage of graduates (completion efficiency) by generational cohort of cycle B; in bachelor degrees	*r*	-0.330	0.313	0.643
Percentage of graduates that graduated by generational cohort of Cycle A; during the first year after graduating from Bachelor degree	*r*	0.084	-0.134	-0.218
Percentage of graduates that graduated by generational cohort of Cycle B; during the first year after graduating from Bachelor degree	*r*	-0.263	-0.107	0.156
Percentage of students graduated from Bachelor degree that carried out a work activity during the first year after graduating, and was related or consistent to their studies	*r*	0.258	0.371*	0.113
Percentage of students satisfaction	*r*	-0.280	-0.021	0.259
Percentage of graduates satisfaction	*r*	-0.062	-0.196	-0.134
Percentage of employers satisfaction regarding the graduates development	*r*	-0.312	-0.462*	-0.150
Percentage of favorable opinions regarding education programs results of the Institution, of a representative sample of society	*r*	-0.213	-0.155	0.058

**. Correlation is Significant at Level 0.01 (Bilateral).*. Correlation is Significant at Level 0.05 (Bilateral).

CONCLUSIONS

The data allow us to compare the evolution of quality development indicators, with which the competitiveness of UPE in Mexico is evaluated, specifically, regarding indicators as a main tool for the funding of higher education used by PFCE.

We can observe in the data that there is no significant relation in years 2015 and 2017. Even though increases in some indicators are shown, none of them shows a significant level close to 0.8. The correlation for both years is below 0.5.

Based on this relation between variables of implementation of telematics and education programs and indicators of withholding rates, completion efficiency, and work integration of graduates from bachelor degree programs, it is still interesting to observe that the TIC relation does not show a significant impact with academic results in UPE in Mexico, even with their huge usefulness in education, and as a bet of federal politics regarding higher education to elevate quality; nonetheless, the challenge of the current scenario in the country forces public universities to achieve institutional

development indicators in order to obtain greater additional resources.

REFERENCES

1. Amar, R. V. M. (2008). *Tecnologías de la información y la comunicación, sociedad y educación (sociedad, e-herramientas, profesorado y alumnado).* Ed. Tébar, S. L.:España
2. ANUIES (2003). *Estudio sobre el uso de las Tecnologías de Comunicación e Información para la virtualización de la Educación Superior en México*. IESALC/ANUIES: México
3. Arredondo, López y Llórenz (2015). Experiencias de incorporación de tecnologías de información, comunicación y colaboración en educación superior. REATICC UABC.
4. Belloch, O. C. (2012a). Las tecnologías de la información y Comunicación (T. I. C.). Unidad de Tecnología Educativa. Universidad de Valencia. Recuperado de http://www.uv.es/~bellochc/pdf/pwtic1.pdf
5. Buela-Casal, G. y Castro, A. (2009) (Coords.). Las tecnologías de la información y la comunicación y la evaluación de la calidad en la educación superior. *Revista de la Universidad y Sociedad del Conocimiento (RUSC).* (6) (2).
6. Cobo, R. J. C. (2009). El concepto de tecnologías de la información Benchmarking sobre las definiciones de las TIC en la sociedad del conocimiento. Revista ZER. (14)(27), pp. 295-318. Recuperado de http://www.ehu.eus/zer/hemeroteca/pdfs/zer27-14-cobo.pdf
7. Castillo, D. M.; Larios, R. V. M. and García, P. de L. O. (2010). Percepción de los docentes de la utilización de las Tecnologías de la Información y la Comunicación. *Revista Iberoamericana de Educación*. (53) (6). Recuperado de rieoei.org/deloslectores/3375Castillo.pdf
8. Díaz, B. A. F. (2010). Integración de las TIC en el currículo y la enseñanza para promover la calidad educativa y la innovación. UNAM. In Marchesi, Álvaro; Poggi, Margarita (coords.) Presente y futuro de la educación iberoamericana. Revista Pensamiento Iberoamericano. (7) pp. 129-149. Recuperado de http://giddet.psicol.unam.mx/giddet/prod/articulos/art_integracion_tic.pdf
9. Hernández, Fernández y Baptista (2010). Metodología de la Investigación Científica. McGraw Hill.
10. Herrera, B. M. A. (2009). Tecnologías por estudiantes universitarios en México: perspectivas para una incorporación innovadora. *Revista Iberoamericana de Educación*. (48) 6-10 de marzo. OEI.
11. Meneses, B.G. (2007). Las TIC en la Universidad. (tesis). Recuperado de http://www.tdx.cat/bitstream/handle/10803/8929/5LasTICsenlaUniversidad.pdf;jsessionid=43ECC4787691FE2F479FAC005497BA11.tdx1?sequence=11
12. Mesa, J. F. Y. (2012). Lastecnologías de la información y la comunicación en la Universidad Colombiana: evolución y prospectiva. *Revista Historia de la Educación Latinoamericana*. (14) (19),pp. 71-90.
13. Marqués, G. P. (2012). *Impacto de las TIC en la educación: funciones y limitaciones. Revista de investigación. Universidad de Barcelona: España*.

14. PND (2013). Plan Nacional de Desarrollo 2013-2018. Recuperado de http://www.sep.gob.mx
15. Presidencia (2016). Cuarto Informe de Gobierno 2015-2016. Recuperado de http://www.presidencia.gob.mx/cuartoinforme
16. PROFOCIE (2014). Reglas de operación Reglas de Operación del Programa de Fortalecimiento de la Calidad en Instituciones Educativas (PROFOCIE). Diario Oficial. Recuperado de http://pifi.sep.gob.mx/profocie/reglas/2015/ro_profocie_2015.pdf
17. SEP (2013a). Sistema Educativo de los Estados Unidos Mexicanos. Principales cifras. Ciclo Escolar 2012-2013. Subsecretaría de Educación Superior. Recuperado de http://www.siged.sep.gob.mx
18. SEP (2013b). *Programa Sectorial Educativo 2013-2018*. Recuperado de http://www.sep.gob.mx
19. SEP (2016). Guía PFCE 2016-2017. Recuperadodehttp://www.copladi.udg.mx/desarrollo-institucional/pifi
20. UNESCO (1998): *Declaración Mundial sobre la Educación Superior en el siglo XXI: visión y acción*. Recuperado de http://www.unesco.org/education/educprog/wche/declaration_spa.htm
21. UNESCO (2003). *Declaración de Quito sobre el rol de las universidades en la sociedad de la información*. Recuperado de http://tecnologiaedu.us.es/cuestionario/bibliovir/quito.pdf
22. UNESCO (2013). Enfoques estratégicos sobre las TIC en educación en América Latina y el Caribe. Chile. Recuperado de http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Santiago/images/ticsesp.pdf