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Perceptions of Students towards ICT Competencies at the University

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Abstract. The purpose of this study is to identify the perceptions of university students towards their ICT Competencies from two universities, one in Mexico and the other in Hungary. The research type is quantitative and exploratory. The instrument consists of 14 questions related to three types of competencies: Basic, Application and Ethical. The sample was of 567 students, 302 students from the Veracruzana University in Veracruz, Mexico and 265 students from Óbuda University in Budapest, Hungary. The quantitative data analysis was performed with SPSS software using descriptive statistics and ANOVA tests. The situation of education in Hungary and Mexico is not so very different although each country has taken different paths in the field. The results referring to the perceptions of Hungarian and Mexican students towards ICT competencies indicate that they perceive themselves with a positive valorisation. Also the perceptions of the students indicated that the highest ponderation obtained was for Ethical Competencies, followed by Basic Competencies and finally Application Competencies.

Keywords: perceptions of students, ICT competencies, Mexico education, Hungary education, University.

1. Introduction

The training process of university students focuses on developing a set of competencies in order to acquire their university degrees. In this sense, we can point to at least two large blocks which are common at the international level: generic and specific competencies (Aypay, 2010).

Within the preferred generic competencies that apply in most of the university educational programs on the international level, we find ICT competencies identified by various international education programs of UNESCO (MDO: Millennium Development

Objectives; EFA: Education for All; UNLD: United Nations Literacy Decade; DESD: Decade of Education for Sustainable Development).

In this sense, according to Fuentes (2007), we could say that competency is: A set of knowledge, skills, attitudes, and values that is needed to effectively perform an occupation or a productive role. In a similar way Yañez-Galecio (2005) affirms that competency could be seen as an attribute of a person: specifically competency can be related to his/her success in the performance of a task. In this way failure is seen as the absence or low level of development of one or several competencies associated with a specific activity.

Meanwhile, Tobón (2013) defines competency as the integrated actions performed by a person in order to carry out activities and solve problems, based on certain eligibility criteria, continuous improvement and ethics. So, it can be said that ICT competencies are a group of skills, knowledge and attitudes that are applied to the use of information and communication systems, as well as the devices that the activity involves and, according to *NETS for Students* (NETS, 2007a, NETS, 2007b), also the knowledge that people should have and be able to learn and transfer, effectively, in order to live productively in a digital world.

Thus, these ICT competencies are being taken into consideration in the educational standards that various countries have developed in the form of profiles, such as NETS (NETS, 2007a, NETS, 2007b) in the United States, the Official certificate in Computing and Internet (B2i) in France, the incorporation of ICTs indicators in the National Curriculum in England, as well the transversal integration of the ICTs in schools, in Belgium (Aypay, 2010).

Also in Hungary and Mexico national policies have even been working on increasing the development of these ICT competencies in their teachers and students. But the results are quite different as we will discuss later. We could say that Hungary has developed its own standards for developing ICT competency, but Mexico has failed to extensively develop and implement these standards.

Hence many international authorities describe key points of the educational development of ICT-literate students. For instance, NETS (NETS, 2007a, NETS, 2007b) includes: the ability to make Web designs, presentations, databases, and the ability to use graphics software, spreadsheets, databases, online applications, e-mail, chat applications and word processors, among others. Moreover, UNESCO (2008) has presented the ICT competency standards for teachers, which combines the requirements for teachers and students in today's world and emphasizes the current importance of ICT for all countries, including the members of the OECD (2013).

Finally it is relevant to say that for this study we took the classification of Competencies in ICT proposed by García-Valcárcel and Arras (2011) designed through the revision of different internationals recommendations. It is important to mention that this classification have been used in several studies published in Spanish, thus for scientific literature in English could be considered as a proposal. In this sense, the proposal classification of Competencies in ICT is the following:

(a) Basic competencies (also called digital literacy competencies).
(b) Application competencies.
(c) Ethical competencies.

So, the core competencies of digital literacy (a) are related to the use of ICT in classroom presentations and activities, and involve the use of digital tools to obtain information, and the use and development of materials obtained from various online sources. Meanwhile, application competencies (b) are related to the use of skills and knowledge to create and manage complex projects, solve problems in real-world situations, collaborate with others, and make use of information and networks of experts. Finally ethical competencies (c) are related to the ethical, legal and responsible use of ICT.

An international comparison analysis tool is an effective way for understanding the situation between two or more different regions of the world. In this sense, literature shows the relevance of analyzing how ICT has been used in education to better understand educational strategies, learning methods and pedagogical techniques in order to effectively apply ICT in the classroom.

One recommendation for international organizations is to perform periodic measuring about technological infrastructure, access to ICT and ICT usage data in each organization and country. Also is relevant that stakeholders in education should consider incorporating the assessment of digital literacy of students and teachers as a core component of the evaluation system (UNESCO, 2015). Certainly ICT competencies is completely related with this issue.

For this reason, in this study we review the current situation of students in two universities. One is Óbuda University in Budapest, Hungary and the second one is the Veracruzana University located in Veracruz, Mexico. In order to contextualize how ICT is being adopted in these two countries, some data taken from international sources will be presented in this article.

2. Methodology

The purpose of this study is to identify the perceptions of university students towards their ICT Competencies from two universities, one in Mexico and the other in Hungary. The research type is quantitative. The methodological strategy used was the replication of the instruments used by one of the authors in another international research project where perceptions of teachers and students from two Mexican universities (Veracruzana University and Chihuahua University) and one Spanish university (Salamanca University) were compared (García-Valcárcel and Arras, 2011). However, in this paper the results of an exploratory study comprising just one dimension of the instruments that were applied are shown: Students' impressions about their ICT competencies.

The instrument for measuring the perceptions of students towards ICT competencies is composed of 14 questions. The reliability of the questionnaire obtained by the Cronbach technique was 0.87. The design of the instrument included the Likert scale with four categories: "Not at all, A little, Quite a lot and A lot". These categories indicates the level of confidence of the students about their skills and knowledge towards ICT competencies. So it is just related with the beliefs of the students, with the attitude towards their ICT competencies.

For the purposes of this study it is assumed that the perception of the students with a certain level of confidence about their ICT competencies fit into the categories "Quite a lot" and "A lot". The selection of these categories reflect a positive attitude of students. Meanwhile, the perception of the students about the absence or deficiency in ICT competencies is represented by "Not at all" and "A little". In this case, the selection of these categories reflect a negative attitude of students.

Table 1 contains the types of competencies and their associated questions following the analytical proposal of García-Valcárcel and Arras regarding the division into three types: (1) Basic Competencies; (2) Application Competencies; and (3) Ethical Competencies (García-Valcárcel and Arras, 2011).

The sample consisted of 567 students. Of these, 302 students belonged to the Bachelor's of Administrative Computer Systems at the Veracruzana University located in Veracruz City, Mexico, and 265 students were from the Bachelor's of Mechatronics Program at Óbuda University in Budapest, Hungary. Inclusion criteria for the sample were: (1) Public universities; (2) Students close to graduation; and (3) Students of a bachelor strongly oriented to the use of computer. It is relevant to mention that the chosen bachelor was taken for the convenience of the researchers because they teach there. So, the strategy applied was to find similar criterias.

At this point it is relevant to mention that the research question that guides this study was the following: How different are the perceptions of university students towards their ICT Competencies in a bachelor strongly oriented to the use of computer in Óbuda University and Veracruzana University?.

Table 1
Types of competencies

Type of competencies	Description of the question
Basic Competencies	● You use the main informatic and network resources. ● You use the applications in a productive way. ● You apply digital tools in order to obtain information from varied sources. ● You make use of models and simulations in order to explore complex topics. ● You interact and collaborate with your partners, using a variety of digital resources.
Application Competencies	● You communicate information and ideas effectively, using a variety of media and formats. ● You participate in groups that develop projects for the production of original works or problem solving. ● You solve problems, and make decisions using the appropriate tools and digital resources. ● You plan and organize the necessary activities in order to solve a problem or carry out a project. ● You create original work as a medium of personal expression.
Ethical Competencies	● You select, analyze, and make ethically correct use of the information obtained. ● You make rational, legal and responsible use of information using ICT. ● You value ICT as an instrument of permanent learning. ● You value ICT as a medium of collaboration and social communication.

In this sense a hypothesis was proposed: There are significant differences in the perception of the students regarding their ICT Competencies between the two participating universities (Óbuda University and Veracruzana University).

3. Review of Some ICT Indicators about Mexico and Hungary

When The Global Information Technology Report (GITR) and the Networked Readiness Index (NRI) were created several years ago, the attention of decision makers and investors was on adopting business and financial strategies that would allow them to develop within the context of a fast-moving but nascent Internet economy.

For more than a decade, the NRI has provided decision makers with a useful conceptual framework for evaluating the impact of information and communication technologies (ICT) at a global level, and to benchmark the ICT readiness and the usage in their economies.

The networked readiness framework translates into the Networked Readiness Index (NRI), a composite indicator made up of four main categories (subindexes), 10 subcategories (pillars), and 53 individual indicators distributed across the different pillars:

(1) Political and regulatory environment.
(2) Business and innovation environment.
(3) Infrastructure.
(4) Affordability.
(5) Skills.
(6) Individual usage.
(7) Business usage.
(8) Government usage.
(9) Economic impacts.
(10) Social impacts.

For this study is relevant to review some indicators of the following pillars: (3) Infrastructure, (4) Affordability, (5) Skills, (6) Individual usage. Reviewing some data about these topics we figure out what is the current situation in Mexico and Hungary. It is relevant to mention that Hungary and Mexico are classified in a similar situation according to the income level classification provides by World Bank. Both countries have upper-middle-income economies (UM). So, even they belong to a different geographic region is valid to proceed with a comparison analysis.

The Infrastructure pillar captures the state of a country's ICT infrastructure as well as infrastructure that matters for ICT development: mobile network coverage, international Internet bandwidth, secure Internet servers, and electricity production.

The Affordability pillar assesses the affordability of ICTs in a country through measures of mobile telephony usage costs and broadband Internet subscription costs, as well as an indicator that assesses the state of liberalization in 17 categories of ICT services, because more intense competition tends to reduce retail prices in the long run.

The Skills pillar measures the capacity of the population to make effective use of ICT by taking into account the enrollment rate in secondary education, the overall quality of

the education system, and of mathematics and science education in particular, and adult literacy.

The Usage subindex assesses the extent of ICT adoption by a society's main stakeholders: government, businesses, and individuals. The Individual usage pillar measures the level of diffusion among a country's population, using mobile telephony penetration, Internet usage, personal computer ownership, and the use of social networks.

According to the Networked Readiness Index (NRI) of 2015 (Dutta *et al.*, 2015), Hungary was ranked in the 53rd position with a score of 4.3 while Mexico was ranked in the 69th position with a score of 4.0. In we take into consideration the previous NRI report, from 2014, Hungary descended 6 positions in 2014, but Mexico advanced 10 positions from 79th place in 2014 to 69th in 2015. Fig. 1 shows the rank obtained by each country in every pillar.

Mexico experienced a sharp rise of 10 positions to attain the 69th place in the rankings according to The Global Information Technology Report 2015. This improvement is largely attributable to a revision of the mobile telephony tariff data, which causes the country to leapfrog 89 places in the Affordability pillar. Mexico ranks 4th on this pillar which includes mobile and broadband tariffs, both based on 2013 data.

The challenges in the other areas remain considerable. Mexico ranks no better than 56th in the other nine pillars (Political and regulatory environment, Business and Innovation environment, Infrastructure, Skills, Individual usage, Business usage, Government usage, Economic impacts, Social impacts), and lies beyond the 50th mark in 43 of the 53 individual indicators composing the NRI. The poor quality of both the country's business and innovation environment (87th) and its overall regulatory framework (70th) is especially problematic. The level of taxation (117th) and the shortcomings of its legislative process and judiciary system contribute to this situation (Dutta *et al.*, 2015).

The country's capacity to leverage ICTs is further limited by the level of education of the population, which translated to an unflattering 92nd rank in the Skills pillar, Mexico's worst showing among the 10 pillars. ICT uptake among businesses (72nd) and the population at large (87th) remains very low, not only in global comparison but even within the

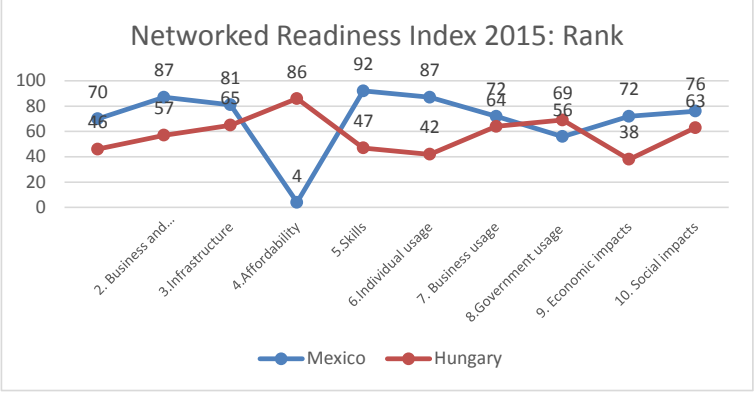

Fig. 1. Networked Readiness Index 2015: Rank by pillar.

region, which is known for its low level of ICT adoption. There are few signs that ICTs are having any significant impacts on economy (72nd) or society (76th), as reflected in the weak innovation capacity of Mexican business (72nd) and the small share of the country's workforce employed in knowledge intensive activities (Dutta *et al.*, 2015).

As a result, the ICT uptake in terms of Internet users (111t^{h}) or households with Internet access has not progressed. This, coupled with a skills shortage (87th) because of the low quality of the educational system (122th), has resulted in little progress in terms of economic impact accruing from ICTs (72nd). Also the country has made less progress in further developing its ICT infrastructure (82nd) and significantly (63rd) reducing its access costs (Dutta *et al.*, 2015). Adopting and implementing a holistic digital agenda that could boost the development and uptake of ICTs and their inclusion in a more robust innovation system would help address some of these important weaknesses and provide better results.

Meanwhile, the situation of Hungary has remained stable with little variation in their rankings, despite relatively well developed ICT infrastructures and penetration rates. However, serious weaknesses in their innovation systems hinder their capacity to properly integrate their digital development into a functional ecosystem that allows for higher innovation rates (Bilbao *et al.*, 2013).

Hungary belongs what was once a fairly homogenous group of Eastern European countries that have joined the European Union (EU) since 2004 [Slovenia (37th, down one), the Czech Republic (43rd, down one), Hungary (53rd, down six), Croatia (54th, down eight), and the Slovak Republic (59th, no change)]. So, even the countries in the same geographic area are presenting changes in rankings. Specifically Hungary is losing ground (Dutta *et al.*, 2015).

Referring to the infrastructure pillar, Hungary occupies middle positions in NRI for several indicators: Mobile network coverage – % pop. (66th), International Internet bandwidth – kb/s per user (75th). However, taking in consideration their small population it was possible to get a better position for the indicator of Secure Internet servers / million pop. (36th).

In the case of Affordability pillar, Hungary is not so well positioned as Mexico: Prepaid mobile cellular tariffs – PPP $/min (75th), Fixed broadcast Internet tariffs – PPP $/month (102th) and Internet & telephony competition (70th).

On the other hand, Skills pillar presents a diverse situation expressed in the following manner: Quality of educational system (96th), Quality of math & science education (60th), Secondary education gross enrollment rate in percentage (27th) and Adult literacy rate in percentage (18th).

Finally, about the Individual usage pillar reflect a well positioned ranks for Hungary in many areas: Individuals using Internet in percentage (35th), Households w/personal computer in percentage (38th), Households w/Internet access in percentage (36th), Fixed broadband Internet subs/100 pop. (27th) and Use of virtual social networks (69th).

These indicators provide an idea about the similarities and differences of both countries. Anyway both countries need to make efforts to improve their position in the ICT adoption for all areas. They share a similar income level classification provided by World Bank (upper-middle-income economies), also both countries belong to a strong

development zone: Hungary belongs to European Union (EU) and Mexico is very near to USA and have several commercial trades. However, there are areas of opportunity to take care; for instance in the case of Mexico their capacity to leverage ICTs is further limited by the level of education of the population and the need to make improvements with their government. Meanwhile, Hungary needs to attend their capacity to properly integrate their digital development into a functional and integrated system.

4. Educational Perspectives in Mexico and Hungary

Governments are paying increasing attention to international comparisons as they search for effective policies that will enhance individual's social and economic prospects, provide incentives for greater efficiency in schooling, and help to mobilize resources to meet rising demands. As part of its response, the OECD Directorate for Education and Skills devotes a major part of its effort to the development and analysis of the quantitative, internationally comparable indicators that it publishes annually in *Education at a Glance.* These indicators enable educational policy makers and practitioners alike to see their educational systems in light of other countries' performance and, together with the OECD country policy reviews, are designed to support and review the efforts that governments are making towards policy reform.

In this sense, *Education at a Glance Report* (OECD, 2013) addresses the needs of a range of users, from governments seeking to learn policy lessons, to academics requiring data for further analysis, to the general public wanting to monitor how its country's schools are progressing in producing world-class students. The publication examines outcomes in the quality of learning, the policy levers and contextual factors that shape these outcomes, and the broader private and social returns that accrue to investments in education.

Education at a Glance 2013: OECD Indicators (OECD, 2013) offers a rich, comparable and up-to-date array of indicators that reflect consensus among professionals on how to measure the current state of education internationally. The indicators provide information on the human and financial resources invested in education, how education and learning systems operate and evolve, and the returns for educational investments. The indicators are organized thematically, and each is accompanied by information on the policy context and the interpretation of the data.

The classification of the levels of education is based on the International Standard Classification of Education (UNESCO, 2012). ISCED 1997 is an instrument for compiling statistics on education internationally and distinguishes among six levels of education. ISCED 1997 was recently revised, and the new International Standard Classification of Education (UNESCO, 1997) was formally adopted in November 2012. This new classification was implemented in the data collection of May 2014.

The six levels of education are the following: (0) Pre-primary education; (1) Primary education, First stage of basic education; (2) Lower secondary education, Second stage of basic education; (3) Upper secondary education; (4) Post-secondary non tertiary education; (5) First stage of tertiary education (not leading directly to an advanced

research qualification); (6) Second stage of tertiary education (leading directly to an advanced research qualification). For more information on this classification consult ISCED (UNESCO, 2012).

Nowadays there are more people participating in education than ever before. Differences between generations in educational attainment and growth in tertiary and secondary attainment are reflected in the trends of attainment rates. On average, since 2000 the proportion of people with no upper secondary education decreased and the proportion of people with tertiary education grew in most OECD countries. Upper secondary and postsecondary non-tertiary attainment levels have remained stable in most OECD countries over the same period.

4.1. *Tertiary-type B (Vocational), Tertiary-type A (Academic)*

The percentage of today's young people expected to graduate from tertiary-type B (vocational) programs before turning 30 in Hungary (6%, ranking 12/21) and Mexico (2%, ranking 15/21) rank as two of the lowest among OECD countries with data available. A similar situation occurs in these two countries regarding the percentage of today's young people expected to graduate from tertiary-type A (academic) programs before turning 30. Both countries rank in two of the lowest positions in OECD countries (Hungary 23%, ranking 23/25; and Mexico 20%, ranking 24/25).

4.2. *Tertiary*

Referring to the level of tertiary attainment among 30–34 year-olds both countries are the lowest ranked among OECD countries with data available. Hungary reports 28% with a ranking of 26/34 while, Mexico indicates 20% with a ranking of 32/34. A similar situation occurs in relation to the level of tertiary attainment among 25–64 year-olds in both countries (Hungary has 21% with a ranking of 28/36, and Mexico has 17% with a ranking of 32/36). Also for the indicator on the employment rate among 25–64 year-old individuals with a tertiary education, Hungary is comparatively low (79 %, ranking 31/36) and Mexico also (79%, ranking 30/36) with the same values and side-by-side positions.

Moreover, Hungary (75%, ranking 28/36) and Mexico (71%, ranking 32/36) also have similar positions in relation to the employment rate among women with a tertiary education, which in both cases is comparatively low. Another similarity appears in the indicator of the annual expenditure per tertiary student where both countries report very low rankings among OECD countries (Hungary the equivalent of 8745 USD, ranking 25/33; and Mexico the equivalent of 7872 USD, ranking 27/33). In another comparison, in Hungary, cumulative expenditure per tertiary student is one of the lowest among OECD countries with data available (the equivalent of 28764 USD, ranking 18/20). In Mexico, this indicator reports that it is also one of the lowest among OECD countries (the equivalent of 26373 USD, ranking 20/20).

However, with reference to the indicator for the change in total public expenditure for all services, including education between 2008 and 2010 there is quite a marked difference between these countries. Hungary has one of the lowest expenditures among OECD countries with data available (95 Index, ranking 31/34). In contrast Mexico has one of the highest among the countries compared (124 Index, ranking 2/34).

Meanwhile, we found a similar situation in both countries in reference to the indicator of the change in public expenditure on education as a percentage of the total public expenditure between 2008 and 2010. Hungary (95 Index, ranking 25/30) and Mexico (86 Index, ranking 29/30) report to be near the lowest positions among OECD countries with data available.

A different situation is found for the expected number of years a person will study for 15–29 year-olds as we found disparity in the values. In the case of Hungary, it has one of the highest numbers among OECD countries with data available (7%, ranking 9/35). However, you can find a very different situation for Mexico; its ranking being one of the lowest among the countries compared (5%, ranking 33/35). Finally, the proportion of 25–29 year-olds who are neither employed nor in education or training is comparatively high in both countries. Hungary indicates 27% with a ranking of 8/34, and Mexico reports 29% with a ranking of 4/34.

5. Results of the Perceptions of Students towards ICT Competencies

The competencies that students have for using technological tools productively and ethically in the search and organization of information, in problem solving and collaborative work, as well as in improving their communication processes, are vital for efficiently responding to the demands that arise in teaching contexts that significantly integrate ICT.

The 14 questions that integrate the perception of the students towards ICT competencies were divided into three main dimensions: Basic Competencies, Application Competencies and Ethical Competencies. Table 2 shows that most of the questions are in the categories “Quite a lot” (3) and “A lot” (4), which indicates that the majority of the students considered themselves competent in the use of ICT.

The ICT competencies in which the students recognize the need for further training (with equal and higher mean values of 3.00, on a scale of 1–4 points) and which could be considered as strengths are: (a) You apply digital tools to obtain information from varied sources, and (b) You value ICT as a permanent instrument of learning.

Meanwhile, the questions on ICT competencies rated the lowest (with mean values below 2.5) and which could be recognized as weaknesses, are: (c) You make use of models and simulations to explore complex topics, and (d) You create original work as a medium of personal expression.

The remaining 10 questions have values of between 2.5 and 3.0, which can be considered satisfactory since the mean value of the perception of the students towards ICT competencies is around 2.75. It is relevant to note that these data were obtained with respect to student’s self perceived beliefs. So, we are not sure if is related with their real skills and knowledge about ICT.

Table 2
Types of competencies: Global results

Question	Not at all	A little	Quite a lot	A lot
Basic Competencies Dimension				
You use the main informatics and network resources.	2.1%	27.2%	57.6%	13.1%
You use the applications in a productive way.	3.0%	30.3%	56.5%	10.2%
You apply the digital tools to obtain information from varied sources.	2.1%	16.1%	61.9%	19.9%
You make use of models and simulations to explore complex topics.	12.7%	51.7%	29.1%	6.5&
You interact and collaborate with your partners, using a variety of digital resources.	53.%	25.2%	49.6%	19.9%
Application Competencies Dimension				
You communicate the information and ideas in an effective way using a variety of media and formats.	1.9%	34.1%	52.9%	11.1%
You participate in groups that develop projects for the production of original work or problem solving.	7.2%	38.7%	43.2%	10.9%
You solve problems, and make decisions using the appropriate tools and digital resources.	4.8%	30.5%	52.7%	12.0%
You plan and organize the required activities to solve a problem or carry out a project.	3.7%	36.7%	47.4%	12.2%
You create original work as a medium of personal expression.	11.6%	46.4%	34.6%	7.4%
Ethical Competencies Dimension				
You select, analyze, and make ethical use of the information obtained.	2.3%	33.5%	51.3%	12.9%
You make rational, legal and responsible use of the information obtained through ICT	3.2%	26.1%	58.7%	12.0%
You value ICT as an instrument of permanent learning.	1.1%	11.5%	53.4%	34.0%
You value ICT as a medium of collaboration and social communication.	3.7%	18.3%	54.0%	24.0%

Table 2 shows global results about the perceptions of students toward ICT Competencies. So, it reflects data of the Mexican university and also of Hungarian university.

5.1. *Differences in Perceptions of Students towards ICT Competencies: University*

In Table 3, we can check the average values in the competencies for each university. Also we can check the results of the ANOVA test. According to the ANOVA test significant differences were found in at least 8 different questions.

Fig. 2 shows an overview of the profile that exists in the various dimensions of ICT competencies. It is clear that similar perceptions exist between students from the two countries. However the dimension of Application Competencies presents a major difference in favor of Mexican students. Basic and Ethical Competencies show very similar values, being slightly higher for the Mexican students.

Table 3

Average values in the perceptions of students towards ICT competencies for each university

Question	GA	UV	OUA	LS	Sig.
You use the main informatics and network resources.	2.82	3.02	2.58	18.83	0
You use the applications in a productive way.	2.74	2.86	2.6	0.066	0.8
You apply the digital tools to obtain information from varied sources.	3	3.02	2.97	7.68	0.01
You select, analyze, and make ethical use of the information obtained.	2.75	2.9	2.57	10.59	0.00
You communicate the information and ideas in an effective way using a variety of media and formats.	2.73	2.67	2.8	2.92	0.09
You make use of models and simulations to explore complex topics.	2.29	2.46	2.11	5.97	0.02
You interact and collaborate with your partners, using a variety of digital resources.	2.84	2.71	2.99	10.89	0.00
You participate in groups that develop projects for the production of original work or problem solving.	2.58	2.42	2.76	4.23	0.04
You solve problems, and make decisions using the appropriate tools and digital resources.	2.72	2.64	2.81	20.66	0
You plan and organize the required activities to solve a problem or carry out a project.	2.68	2.67	2.69	0.11	0.74
You create original work as a medium of personal expression.	2.38	2.66	2.06	11.08	0.00
You make rational, legal and responsible use of the information obtained through ICT	2.8	2.83	2.75	0.72	0.34
You value ICT as an instrument of permanent learning.	3.2	3.2	3.22	57	0.39
You value ICT as a medium of collaboration and social communication.	2.98	3.14	2.81	57	0.39

Note. GA = Global Average, UV = Veracruzana University, OUA = Óbuda University Average, LS = Levene Statistic.

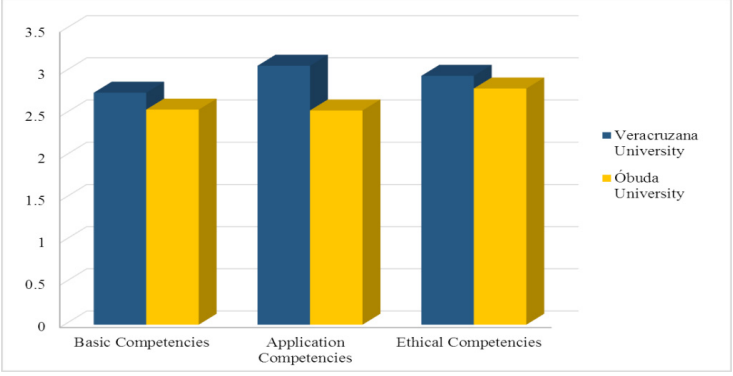

Fig. 2. Means of competencies dimensions: Differences by university.

5.2. *Basic Competencies Dimension*

To provide further details on the manner in which students from both countries recognize themselves as competent in various activities relating to the use of ICT, the percentages obtained for each question comprising the three different dimensions are presented. The

activities in which students claim to be highly proficient (at or above 75% values) are also pointed out.

Basic Competencies can be considered basic for proper scholarly performance. This type of dimension is related to activities such as interaction with others through the digital media, the use of models to explore complex topics, the application of tools used to find information from various sources, the productive use of applications and the use of the main informatics resources.

The percentages obtained in this dimension, indicate the presence of a positive perception of students towards ICT competencies both Mexico and Hungary in many areas (Fig. 3). However, in the question referring to the use of models to explore complex topics, a significant variation in the perception of the students was obtained. The percentage was higher for the Hungarian students (72.1%) in comparison to Mexican students (57.6%).

Meanwhile in interaction through the use of digital resources, there is a higher percentages for the Hungarians (79.2%) compared to the Mexicans (60.9%). In the use and application of digital tools to obtain information from a variety of resources, anew there is a higher percentages in the Hungarian students (85.3%) than the Mexican students (78.8%).

Finally, in reference to the productive use of the applications, and the use of the main informatics resources, we find that there is a positive higher perceptions of the students from Mexico (70.8% and 81.1% respectively) compared to the students from Hungary (61.9% and 58.9%).

The questions rated highest by the Mexican students are those related to the use of the main informatics and network resources and the application of digital tools to

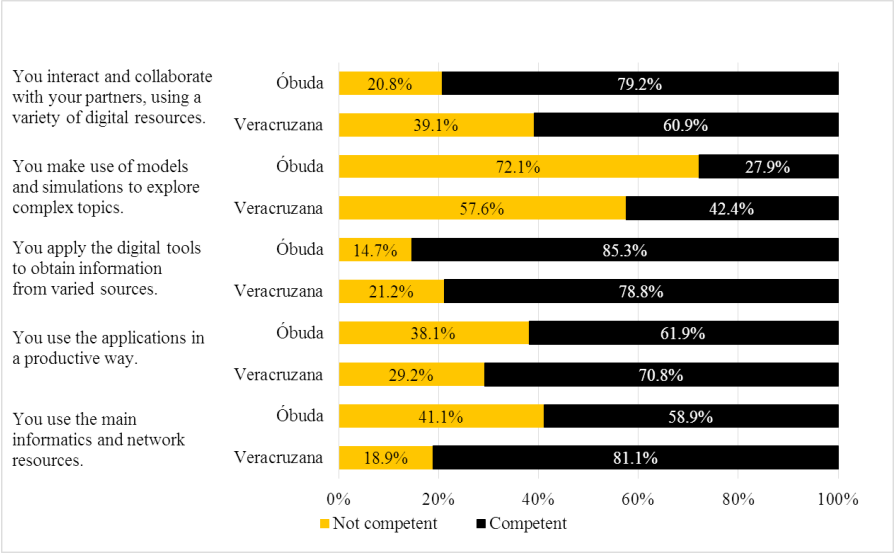

Fig. 3. Basic Competencies: Perceptions of students towards ICT Competencies (%).

obtain information. Meanwhile, their worst ratings are in the use of models to explore complex topics.

For the Hungarians their highest percentages are in interaction and collaboration using digital resources and the application of digital tools to obtain information. The area where they receive the lowest percentages is the one related to the use of models to explore complex topics.

According to this data we can say that Mexican students have higher percentages in basic activities such as the use of applications and the use of the main informatics resources.

5.3. *Application Competencies Dimension*

In the Application Competencies are the questions related to the use that is given to ICT in various fields. Activities such as the creation of work as a medium of expression, the planning, as well as the resolution of problems through digital resources, the participation in groups that use these tools and effective communication using a variety of informatics resources.

Within this dimension we find a positive perception of students towards ICT competencies in both universities (Fig. 4). An exception occurs regarding the creation of work as a medium of personal expression, where the Hungarian students (74.3%) show certain tendency towards non-competency, while at least half of the Mexican students consider themselves competent (56.3%). The Mexican students say that their major percentage of non-competency (55.7%) is in the participation in groups that develop projects for the production of original work. In this same question, the Hungarians show an admissible positive perception (65.3%).

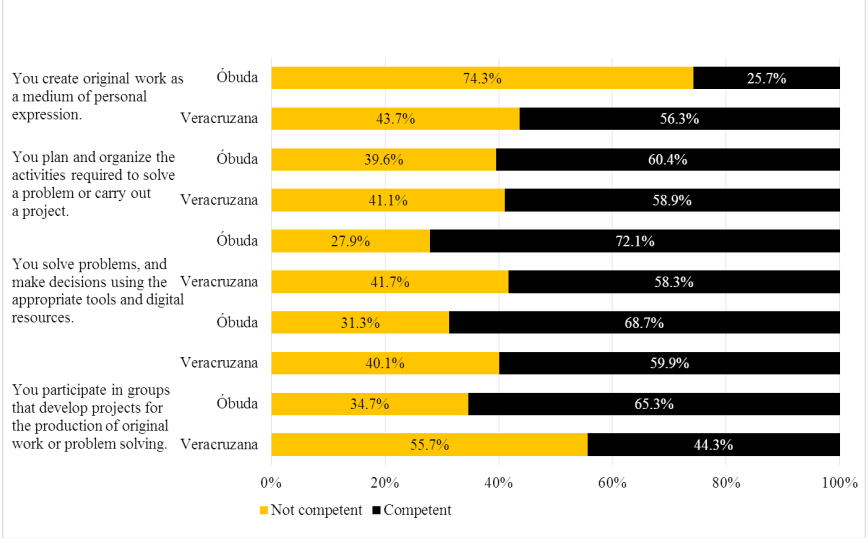

Fig. 4. Application Competencies: Perceptions of students towards ICT Competencies (%).

For the area concerning the planning and organization of activities for problem solving or carrying out projects the Hungarian students (60.4%) show a slightly higher percentage of competency than the Mexicans (58.9%).

In relation to problem solving and decision making through digital resources, and for effective communication through media and formats, the perceptions of the Hungarians (72.1%, 68.7%) indicated higher percentages in comparison to their Mexican counterparts (58.3%, 59.9%).

The Mexican students obtained their highest percentage in the area of communication through media and formats while the area they rate as their lowest percentage is the area related to group participation for problem solving. Meanwhile, for the Hungarians, we find that their highest percentage is problem solving using digital resources. Their lowest percentage is the creation of original work as a medium of communication. In this dimension, the results of the percentages for Mexican students is slightly higher: they evaluate themselves as being more competent than the Hungarian students do.

5.4. *Ethical Competencies Dimension*

Finally, for the dimension of Ethical competencies, we asked the students about their perceptions towards competencies in ethical activities. These questions analyze the impression of the students about ICT as a medium of collaboration and as an instrument of learning, as well as the use that is given to the information obtained from ICT.

The results indicate the existence of a high positive perceptions of students towards ICT competencies in both universities (Fig. 5). Referring to the question of ICT as a medium of collaboration and communication, there is a higher percentage in Mexican students (82.28%) in comparison with the Hungarian students (87.4%). For the area of ICT as a permanent tool for learning, there are high percentages in both cases: Hungarian students 87.6% and Mexican students 87.4%.

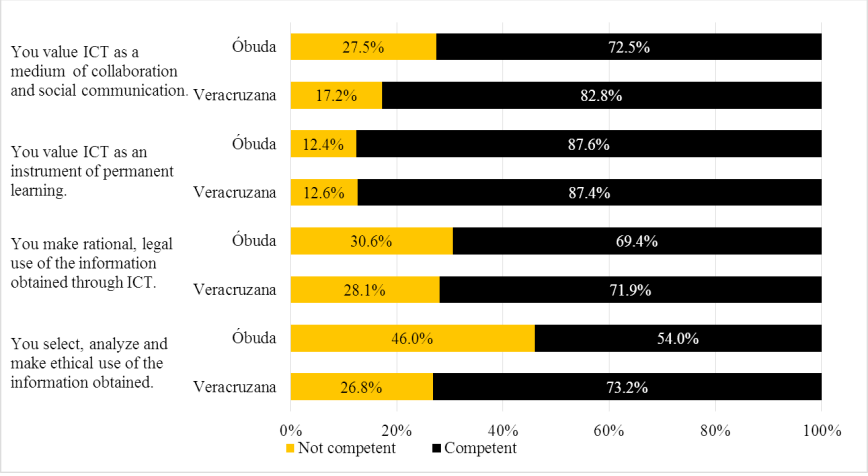

Fig. 5. Ethical Competencies: Perceptions of students towards ICT Competencies (%).

Mexicans and Hungarians consider using ICT as an instrument of permanent learning to be their area of highest ponderation. For Mexican students the area they felt least competent in was the legal use of the information obtained through ICT. Meanwhile the Hungarians perceive their lowest percentage with the selection and ethical use of the information obtained through ICT.

Mexican students show higher percentages in the area of ethical competencies than Hungarian students. Mexican students also perceive themselves with a positive attitude in the areas related to the use of ICT as a medium of collaboration and as an instrument of permanent learning.

5.5. *Differences in the Perception of Students towards ICT Competencies*

The differences between Mexican and Hungarian students found in the ANOVA test include the selection of computer resources and the ethical use of information obtained from the network, interaction with classmates through digital resources, problem solving through the use of digital tools and the creation of jobs as a medium of personal expression. In the rest of the areas no relevant differences were found. Regarding the area "You use the main computer and networking resources" the global results indicate a positive attitude of the students reflected by 70.7 % (57.6% "Quite a bit" and "A lot" 13.1%). While reviewing the results for each university, there is a "mostly competent" trend in the Mexican students (81.1%) compared to the Hungarian students (58.8%).

In relation to the question "You apply the digital tools to obtain information from varied sources" we can see that in the global results once more the students believe are competent, shown by 81.8% (61.9% "Quite a lot" and "A lot" 19.9%). Meanwhile results by university denote that there is a "mostly competent" perception in Hungarian students (85.3%) compared to the Mexican students (78.8%). Regarding the question "You select, analyze, and use the information obtained ethically" the results indicate a positive tendency towards ICT competencies of 64.2% (51.3 % "Quite a lot" and 12.9 % "A lot"). Observation of the results for each university shows more perceived positive ponderation in Mexican students (73.2%) in comparison to the Hungarian students (54%).

On the question "You make use of models and simulations to explore complex topics" the global results show a perception of the students of certain incompetence shown by 64.4 % (12.7 % "Not at all" and 51.7 % "A little"). Analyzing the results for each university we can see a perception of greater incompetence by the Hungarian students (72.1 %) compared to the Mexican students (57.6%). Meanwhile in the question, "You interact and collaborate with your partners, using a variety of digital recourses" the global results show a positive perceptions of the students of 69.5% ("Quite a lot" 49.6% and "A lot" 19.9%). Reviewing the results for each university a perception of more percentage is seen in Hungarian students (79.2%) compared to Mexican students (60.9%).

Referring to the question "You participate in groups that develop projects for the production of original work or problem solving" the global results denote moderate values of 54.1% (43.2% "Quite a lot" and "A lot" 11.0%). The results of each university

show a disparity in trends, because while Hungarian students perceive themselves as competent (65.3%), Mexicans have a perception of non-competency (55.7%). Moreover for the question "You solve problems, and make decisions using the appropriate tools and digital resources" global results show an acceptable positive tendency reflected by 64.7% (52.7% "Quite a lot" and "A lot" 12.0%). The results by university show a higher percentage of the perceptions towards ICT competencies in Hungarian students (72.1%) compared to Mexican students (58.3%).

In the question, "You create original works as a medium of personal expression" the global results mainly indicate a low percentage, denoted by 58% (46.4% "A little" and 11.6% "Not at all"). In the results at the university level, there is a perception of certain disparity in both the Hungarian students (74.3%) and in Mexican students (56.3%).

5.6. *Similitudes in the Perception of Students towards ICT Competencies*

Meanwhile, we found that six questions do not receive significantly different answers. Regarding the question "You use the applications in a productive way" the global results indicate ponderations of 66.7% (56.5% "Quite a lot" and "A lot" 10.2%). Considering the results of Veracruzana University and Óbuda University, we found a similar situation in Mexican students (70.8%) in relation to the Hungarians students (61.9%). For the question "You communicate information and ideas in an effective way using a variety of media and formats" global results denote an acceptable positive perception of the students of 64% (52.9% "Quite a lot" and "A lot" 11.1%). While, observing the percentages by university, there is a slightly higher difference in the perceptions of Hungarian students (68.7 %) compared to Mexican students (59.9%).

In relation to the question "You plan and organize the activities required for solving a problem or carrying out a project" the global results have a moderate positive perception of the students represented by 59.6% (47.4% "Quite a lot" and 12.2% "A lot"). The results by university show a similar percentage about the perceptions of Hungarian students (60.4%) in relation to the Mexicans (59.6%). Regarding the question "You make a rational, legal and responsible use of information obtained through ICT" global results indicate a higher positive perception of the students with 70.7% (58.7% "A lot" and 12% "Quite a lot"). Observing the results by university, we see there is a slightly higher percentage for the Mexican students (71.9%) compared to the Hungarian students (69.4%).

For the question "You value ICT as an instrument of permanent learning" the global results show a positive ponderation of 87.4% (53.4% "Quite a lot" and 34% "A lot"). Meanwhile, checking the results of the Veracruzana University and Óbuda University, we found that there is an almost equal values among Hungarian students (87.6 %) and Mexican students (87.4%). Finally, for the question "You value ICT as a medium of social communication and collaboration" global results indicate an acceptable positive perception represented by 78 % (54% "Quite a lot" and 24% "A lot"). While observing the results by university they reflect a higher percentage in the perceptions for Mexican students (82.8 %) compared to Hungarian students (72.5%).

6. Conclusions

The situation of education in Hungary and Mexico is not so very different although each country has taken a different path. According to the OECD, although Mexico's overall investment in education remains close to the OECD average, its expenditure per student is low and most resources are spent on compensations for staff. In spite of improvements in some educational indices, there has been little or no change in various aspects. For example, the rates of participation of the Mexicans in educational continuity remain low which increases the risk of disengagement from both education and the labor market especially among young women. In Mexico, the attainment of higher levels of education does not necessarily imply lower unemployment rates.

Moreover, in Hungary education is becoming a safety net in the financial crisis. During the recent economic crisis, unemployment rates in Hungary climbed steeply and have remained high ever since. People without an upper secondary or post-secondary non-tertiary education have been hit hardest. At the other end of the spectrum, unemployment rates have been consistently lower for people with a tertiary education. To be educated up to tertiary level makes a significant difference in an individual's earnings. Adults with tertiary education can expect to earn more than double (107%) what their counterparts with only upper secondary and post-secondary non-tertiary education can expect to earn.

In general, the perceptions of the Hungarian and Mexican students towards their ICT competencies indicate a high positive attitude. The perceptions of the students expressed high ponderation in the use of ICT as a permanent means of learning and as a means of social communication. The students also felt they made productive use of the various applications that are offered. The main use given to these tools is obtaining information, and they claim they make legal and responsible use of the resources.

Referring to the hypothesis we proposed, we could say that in some areas there were some significant differences between the two participating universities (Óbuda University and Veracruzana University) in reference to the students' perceptions regarding their ICT Competencies.

In this document a proposed classification of ICT Competencies (Basic, Application and Ethical) was presented. In these terms, the perceptions of the students indicated that the highest level obtained was for Ethical Competencies, followed by Basic Competencies and finally Application Competencies.

Is relevant to remember that Application competencies is related with to the use that is given to ICT in various fields. Activities such as the creation of work as a medium of expression, the planning, as well as the resolution of problems through digital resources, the participation in groups that use these tools and effective communication using a variety of informatics resources. So, it could be recommendable to develop strategies that promote the effective use of technology resources by students and teachers alike in order to improve and develop this type of ICT competencies.

As for differences by university (Veracruzana and Óbuda), the percentages values indicate that there are higher positive perceptions in Mexican university students towards their ICT competencies. The most significant differences are presented in the preference

for working with colleagues who use computer media. So, the Mexicans choose to carry out activities individually, without having to go through a process of collaborative work while the Hungarian students prefer teamwork over individual work.

Finally, it is highly recommendable to apply tests about their ICT Competencies and check if what the students believe matched with what they can do with technology. So, personal confidence is important but not enough to be sure about their skills and knowledge. So, this remain as a future work to do in these universities.

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