Smart cities for wellbeing: youth employment and their skills on computers

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Abstract

The smart cities can be understood as an inclusive space for each and everyone to achieve their best options, within the framework of sustainable development, where institutions boost information and technology environments which help to achieve the highest individual and social well-being with the aim of improving the lives of citizens. The youth group (between 15 and 24 years) was sternly affected for the crisis. In this paper the youth employability, in relation to the new challenges of smart cities, is analyzed in the EU, with the aim of assessing the influence of ICTs skills on youth employability. By means of a mean analysis and a Structural Equation Modelling the differences between the Euro Area and the other countries in the EU is analyzed, as well as the importance of information technologies and the computers skills for increasing youth employability. The results indicate that awareness of the importance of IT skills is greater in the euro area and that computer skills and highly significant to explain the employability of young people. The achieved conclusions point out to the training on computers skills as a key factor for boosting youth employment. This paper contribution could help to increase social wellbeing by means of giving support to policy makers to make decisions to increase youth employment and to provide the qualified workforce to those companies arose among the smart cities. The main original value is to link the computer skills to the employment for the specific youth group in the EU.

Keywords: Youth Employment, Smart Cities, ICTs, European Union, Structural Equation Modelling (SEM)

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Introduction

The sustainable development is related to social issues as well as environmental and economic ones. In addition, the technological and communication issues are closely involved to boost sustainability in all of this areas. “A Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership” (European Union. Directorate General for Internal Policies. Policy Department A: Economic and Scientific Policy, 2014).

Table 1. Some definitions of Smart City

Definition	Source
The use of Smart Computing technologies to make the critical infrastructure components and services of a city -which include city administration, education, healthcare, public safety, real estate, transportation, and utilities - more intelligent, interconnected, and efficient	Washburn, D., & Sindhu, U. (2010). Helping CIOs understand “smart city” initiatives: Defining the Smart City, Its Drivers, and the Role of CIO. Cambridge, MS: Forrester Research, Inc
A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens	Griffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., & Meijers, E. (2007). Smart cities-ranking of european medium-sized cities. Rapport technique, Vienna Centre of Regional Science.
A city striving to make itself "smarter" (more efficient, sustainable, equitable and livable)	NRDC
A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens	Hall, R.E. (2000) The vision of a smart city. In Proceedings of th 2nd International Life Extension Technology Workshop (Paris, France, Sep 28).
An instrumented, interconnected, and intelligent city	Harrison, C., Eckman, B., Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., & Williams, P. (2010). Foundations for smarter cities. IBM Journal of Research and Development, 54(4), 1-16.
A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives	Rios, P. (2012). Creating "The Smart City" (Doctoral dissertation).
A city where the ICT strengthen the freedom of speech and the accessibility to public information and services	Partridge, H. L. (2004). Developing a human perspective to the digital divide in the “smart city”. The proceedings of the biennal company of the Australian Library and Information Association

Source: Adaptation from (Nam & Pardo, 2011)

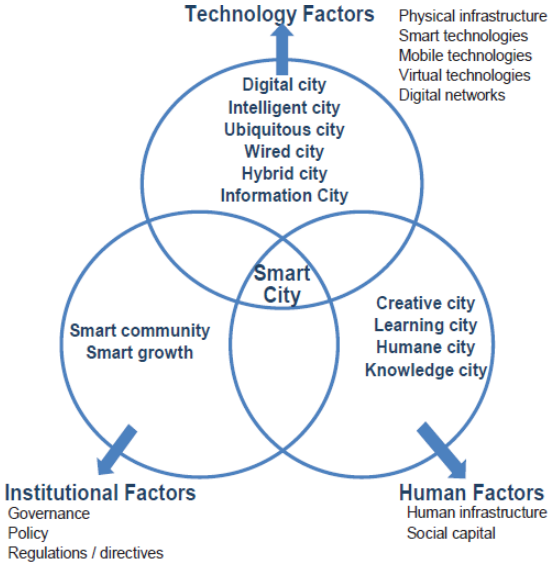
The smart cities are a key point for urban sustainable development. They target to “smart” development by means of improving the Information and Communication Technologies (ICITs) in their area. These ICTs growth and increase has a final goal, which is the improvement the wellbeing of the people living in these urban areas by means of a “smart” environment for all,

which means achieving an more inclusive society for everyone. Then, it could be stated that achieving a more inclusive society could be considered one of the most important reasons for supporting the so called "smart cities". Despite of the great differences on the definition about what a smart city is, there is a common agreement on their intrinsic character linked to sustainable development and ICTs for all, according EU 2020 goals. Actually, a smart life is the one that makes people feel and live better. The literature about smart cities is wide and multidisciplinary (Bibri & Krogstie, 2017) and some authors has underlined the importance of the integration of technical and social perspectives (Levy & Ellis, 2006; Webster & Watson, 2002). Some definitions are provided in Table 1.

This is the "smart era" (Lyons, 2016), with a great amount of devices around are so-called "smart" but the real smartness is achieving welfare and avoiding inequalities, exclusion and poverty. "Intelligent Communities are those which have –whether through crisis or foresight– come to understand the enormous challenges of the Broadband Economy, and have taken conscious steps to create an economy capable of prospering in it" (Intelligent Community Forum)[2].

There are some opinions about the origin of the concept of smart city (Gabrys, 2014) stated that the germen of this kind of cities began to appear as in urban development plans from the 1980s, but there is no a common agreement about this point. In addition there is not a clear conceptual framework for the smart cities. "The label smart city is a fuzzy concept and is used in ways that are not always consistent" (Hollands, 2008; Nam & Pardo, 2011). Nowadays some authors identified the new concept of "smarter cities" (Bibri & Krogstie, 2017).

Figure 1. Fundamental components of a smart city



Source: (Nam & Pardo, 2011)

In this paper, summing up, the smart city is understood as an inclusive space for each and everyone to achieve their best options, within the framework of sustainable development, where

[2] The Intelligent Community Forum is a global network with a think tank at its center. It connects hundreds of cities and regions on five continents for collaboration on economic development and for exchange of expertise and information that drives progress. Through this network, ICF researches how Intelligent Communities use information and communications technology to build inclusive prosperity, solve social problems and enrich their quality of life in our connected century. (see http://www.intelligentcommunity.org/what_is_an_intelligent_community)

institutions boost information and technology environments which help to achieve the highest individual and social well-being.

Some nuances should be made on the concept of smart city, particularly about the concept of sustainable city, because sometimes that identification is not so clear and some additional investigation in this field should be done (Bibri & Krogstie, 2017), particularly about the necessity of a holistic and shared model of smart sustainable city given the systematic perspective on and the universal character of sustainability, and the relation to inclusive societies for all, because it is the pillar for a real sustainable development (Novo-Corti, González-Laxe, & Pociovalisteanu, 2015). Then, these cities face the challenge of combining competitiveness and sustainable urban development simultaneously. Despite the great importance of technological dimension, the more important dimension of the concept of smart city is improving wellbeing for all its inhabitants. The intellectual capital and the social capital are an endowment pillar for smart cities, then they are engaged on developing its human potential by means of promoting education and get a more skilled workers and that is why these cities has better educated people in a more better endowed labor market, because of these more skilled workers (Glaeser & Berry, 2006). Then the conjunction of knowledge, education and ICTs skills become key factors for analyzing whatever in relation to smart cities.

In difficult times for economy, the response of smart cities, reinforcing social cohesion becomes essential. One of the population sectors more affected by the economic crisis are the youth. Their opportunities were diminished due to the global economic situation and some of them has to emigrate, others has to change their plans, others still remains unemployed and all of them are victims of this situation, that, at the moment of writing this paper (2017) seems to be changing. Fighting against youth unemployment as one goal for smart cities. This goal could be achieved by means of promoting ICTs informal courses to increase youth ICT skills on computers and internet. One key feature of smart cities is to lead the rising of new spaces and workplace positions which are an advantage for the youngest who have to previously acquire those skills for offering their workforce in this new positions (López-Arranz, 2017).

In this paper the youth employment from 15 to 24 years in European Union is analyzed related to their ICTs knowledge. In the first section the main concepts and hypotheses are shown. In the second one, the method and materials is explained and in the third the results and discussion are shown. The last section summarizes some reflections and conclusions and reflections are provide for supporting policy makers in their decision making process.

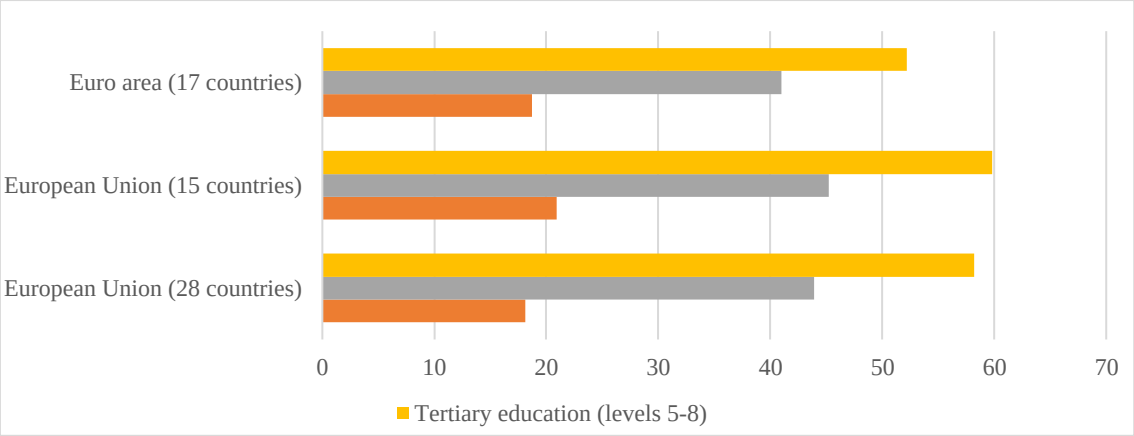
1. Labor market and smart ICTs competences of youth 15-24 in the EU

The main trends of the new labor structure in rent years was analyzed by (Castells, 2011), who indicates that the youth labor possibilities will be in a dual labor market context, which is characterized, on the one hand by its growing flexibility of labor as well as a smaller portion of long-term employed workers, who will have an unpredictable career path, then, the youth will face a more flexible and insecure context. But, on the other hand, there will be a simultaneous growth of highly educated occupations and low-skill jobs; these workers will be the educated knowledge workers so valuable for their companies, that will become the often referred to as ‘‘talent’’ (Castells, 2011). Then two type of workers will appear: the ‘‘self-programmable labor’’ and ‘‘generic labor’’, as (Castells, 2011) labeled. The, the youth should face the necessity of acquiring transversal skills is a key matter for youth employability. In this paper the employment of youth between 15 and 24 years in the European Union is analyzed in relation with the educational level and their skills on computers and internet. Figure 2 shows the employment level attending educational level for youth for Euro Area, EU-15 and EU-28 countries as a percentage of people, related to their reference age sector. For all countries conglomerates the higher is the education level, the higher is the employment. Then, employability is narrowly related to

education (López-Arranz, 2017). In addition, these possibilities are related to the requirements of the companies (Rumberger, 1981). In a smart city, the enhancing of ICTs extent and use will need an entrepreneurial context ready to face this challenge and, then skilled workers are needed.

Some information on youth employment and ICTs skills for conglomerates of countries in the European Union are provided, respectively, on Figure 2 and Figure 3.

Figure 2. Youth employment (15-24 years) by education level in the European Union (2015)



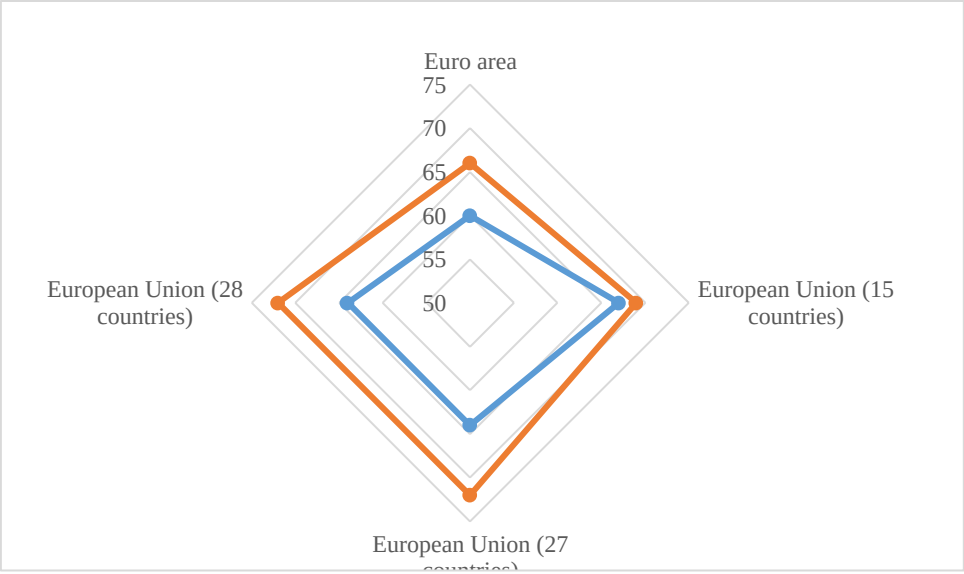
Source: own elaboration from EUROSTAT data

Together with traditional education at colleges and universities, there is another source of skills, which is related to informal education. This source of skills is particularly interesting for these subjects belonging to the area of the IT. In the information era, these requirements are changing so fast that sometimes the traditional education environments can provide this knowledge (Brynjolfsson & McAfee, 2012). On the other hand, the "learning by doing" is a key factor for acquiring the skills on ICTs and computers. Figure 3 shows the EUROSTAT data for youth between 15 and 24 years old attending their assessment about their own adequacy of their computer skills to the labor market and their attainment go formalized education on IT.

These two indicators shown lower levels for the Euro area, what can be interpreted in two different ways: or the youth are aware about their lack of IT skills (then it is a sign of that youth see the necessity of improving) or that the young people into the Euro area really are less skilled. Anyway, there are some differences between European countries that justify the comparative analysis.

OECD states that the Countries with well-established Vocational and Educational Training (VET) and apprenticeship programs have been more effective in holding the line on youth unemployment (OECD, 2016). It is true that there are some opinions pointing out to the destruction of employment destruction due to the new innovative production processes and the technological changes, but other opinions are just pointing out to the opposite direction (Dachs, Hud, Koehler, & Peters, 2017), on the other hand, nobody can be sure about the direction of changes in the future (Biagi & Falk, 2017). Nevertheless to be willing to accept the technological changes and being proactive to getting skills for facing them, will help to improve both personal and social positions in near future. The changes in the smart cities are a proof of this willingness on society and this is a great step to boost the citizenship attitudes.

Figure 3. Individuals (%) who judge their current computer or internet skills to be sufficient if they were to look for a job or change job within a year and who have obtained IT skills through formalized educational institution (school, college, university, etc.), (data 2011). People aged between 15 and 24 years



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The main aim of this paper is focus on the assessment of the youth situation in the European Union in the framework of smart cities and EU-2020 goals, that is to say, analyzing their competences on ICTs and trying to find casual relations between their ICTs skills and their employability in the context of the European Unión. Differences between the groups of countries are analyzed. Two main research questions are specified and some hypothesis for helping to answering these research questions are specified:

Research question 1 (RQ1): Are there differences between the groups of countries of the European Union attending their youth adaptation to the digital world?

H-1-1: There are differences between the Eurozone and the other European countries on awareness of the importance of IT for youth between 15 and 24 years

H-1-2: There are differences between the Eurozone and the other European countries on the ICTs learning for youth between 15 and 24 years

H-1-3: There are differences between the Eurozone and the other European countries on the internet use for youth between 15 and 24 years

H-1-4: There are differences between the Eurozone and the other European countries on the computers use for youth between 15 and 24 years

H-1-5: There are differences between the Eurozone and the other European countries on the computers use for youth between 15 and 24 years

Research question 2 (RQ2): Is there a casual relation between the Computers skills and the employability for youth 15-24 in the EU?

H-2-1: The Computers skills is not significant for explaining the youth 15-24 employability in the EU

2. Method

For testing the RQ1 of ICTs a means comparison between the Eurozone and the other countries in the EU was conducted. Previously the Levene test for equal variances was analyzed. And an Structural Equation Modelling was the method applied for solving the Research question 2 (RQ2). This method is the adequate in this situation, because it is intended to assess a causal relation by means of a regression analysis with one dependent variable (the Computers skills) and other independent variable (The Computes Skills): this is the so-called "structural model". These variable are not easy to measure, because they are "constructs" or "latent variables", which are composited or constructed by means of several indicators, the relation between the latent and observable variables is in Table 3.

The proposed method has to be analyzed taking account three main issues: the global fit of the model, the Structural and the Measure Models. The global fit of the model should be taken account for assessing the model adequateness and it has to give the satisfactory scores to test the global validity of the model. For this measurement, the minimum discrepancy rate (Chi-Squared/df) (Browne, Structures, & Hawkins, 1982; Browne, Cudeck, Bollen, & Long, 1993), the comparative fit index (CFI) (Bentler, 1980) and the Root mean square error of approximation (RMSEA) (Browne & Cudeck, 1993) were analyzed and all results were plenty satisfactory, as can be seen in Table 5. In addition, two are the models that should be analyzed: the measurement and the structural ones. The first one explains the causal relations between the latent variables, whilst the second one analyzes the reliability and the internal consistency of the model, by means of the measure of the relation between each construct and its measurable indicators. The most commonly stated are the Cronbach's Alpha (Cronbach, 1951), the rate of composite reliability (Bacon, Sauer, & Young, 1995) and the extracted variance (Fornell & Larcker, 1981). The latent variables and their indicators are shown in Table 2.

Table 2. Latent variables and indicators

Latent Variable	Indicator
Computers Skills	Individuals who judge their current computer or internet skills to be sufficient if they were to look for a job or change job within a year
	Individuals who judge their current computer or internet skills to be sufficient to communicate with relatives, friends, colleagues over the internet
	Individuals who judge their current computer or internet skills to be sufficient to protect their personal data
	Individuals who judge their current computer or internet skills to be sufficient to protect their private computer from virus or other computer infection
Employment	Education attainment level 0-2
	Education attainment level 3-4
	Education attainment level 5-8

Data were obtained from the EUROSTAT (European Union., 2017), from the specific section about "youth" (yth) contained in the database "Population and social conditions". The EUROSTAT criteria is followed in this work for classifying the young people as "youth": they are those people between 15 and 24 years old. All data were updated at the most recent level provided by the European Union Statistics Office. The software was the IBM statistics SPSS 21 and the AMOS 21.

3. Results

For answering the RQ1 a means comparison analysis was undertaken. In Figure 3 is displayed the information about individuals (%) who judge their current computer or internet skills to be sufficient if they were to look for a job or change job within a year and who have obtained ICTs skills through formalized educational institution (school, college, university, etc.), (data 2011). People aged between 15 and 24 years.

The comparison between the Euro area and the other Member States of the EU has shown only differences for one item (see Table 3). The previous Levene test was conducted for analyzing the equality of variances, which results indicates that equal variances should not be assumed.

Table 3. Means difference test

	Levene test for equal variances		**T test for equal means**				
	F	**Sig.**	**t**	**DF**	**Sig. (two tiled)**	**Means difference**	**Difference standard error**
Individuals who have obtained IT skills through training courses and adult education centers, on own initiative	9.793	0.004	2.686	25,361	0.013	3.082	1.147

*Equal variances was not assumed

For the item "Individuals who have obtained IT skills through training courses and adult education centers, on own initiative" the means are 6.526 and 3.444, respectively, then the difference is 3.082 and statistic significant (0.01).

For answering the Research Question 2, a Structural Equations Modelling was conducted. The results for the measurement model are summarized on Table 4. The measurement model analyzes the consistence of latent variables and their adequate measure, by means of their observable indicators. Then, the factor structure was tested of this model, by means of a confirmatory factor analysis, with the intention of checking the reliability and validity of the measurement scale, previously the factor loadings of all items was checked to proof the required minimum thresholds, which are usually accepted for < 0.5, since all the results exceed these values, then the convergent validity of the scale is expected (Fornell & Larcker, 1981).

To check the reliability and internal consistency of the model, the Cronbach's alpha, rates of composite reliability and variance extracted values were calculated. The reference scores are the next: Alpha ≥ 0.7 (Anderson & Gerbing, 1988; Hair, Tatham, & Black, 1999), composite reliability (CR) should take scores ≥ 0.5 (Bagozzi & Yi, 1988) for confirming the internal consistency of constructs; about discriminant validity, for measuring the accuracy with which the analysis instrument represents the variables, the average variance extracted (AVE) values exceed 0.5 score (Hair et al., 1999). Each latent variable's AVE was larger than the squared correlation between each pair of latent variables, thus demonstrating the good discriminant validity of the scale (Fornell & Larcker, 1981).

Table 4. The measurement model: Reliability and internal consistence of the latent variables

Latent Variable	**Item**	**λ**	**Alpha Cronbach**	**CR**	**AVE**
Youth Employability	1-2	0.674	0.876	0.685	0.825
	3-4	0.833			
	5-8	0.544			
Youth Computers Skills	Job	0.575	0.933	0.790	0.884
	Communication	0.712			

Data Protection	0.950
Virus Protection	0.922

To analyze the global fit of the model the more common indexes were analyzed, and its reference scores are shown in Table 5. Our model has a good or acceptable fitting, according all indexes.

Table 5. Goodness of model fitting

Fit index	Score	Reference scores	
		Good	Acceptable
$\chi 2/df$	1.136	$0 \leq \chi 2/df \leq 2$	$2 \leq \chi 2/df \leq 3$
CFI (Comparative fit index)	0.989	$0.97 \leq NFI \leq 1.00$	$0.95 \leq NFI \leq 0.97$
TLI (The Tucker-Lewis coefficient)	0.982	As close as possible to 1	
NFI (Normed fit index)	0.916	$0.95 \leq NFI \leq 1.00$	$0.90 \leq NFI \leq 0.95$
RMSEA (Root mean square error of approximation)	0.071	$0 \leq RMSEA \leq 0.05$	$0.05 \leq RMSEA \leq 0.10$

The reference values indicates that χ^2 values $1 \leq \chi 2 \leq 2df$ are compatible with an acceptable fitting (Carmines & McIver, 1981). In our model the interval is $1 \leq \chi^2/df = 1.136 \leq 2$. For the comparative fit index, is considered a good adjustment when $0.95 \leq CF \leq 1.00$, and acceptable for $0.94 \leq CF \leq 1.00$, due that the score in this model is 0.989, it is a very good fit. The typical range for TLI lies between zero and one, but it is not limited to that range (Bentler & Bonett, 1980; Bollen, 1989). TLI values close to 1 indicate an acceptable fit. The normed fit index (NFI) indicates a good fitting when $0.95 \leq NFI \leq 1.00$ and acceptable when $0.90 \leq NFI \leq 0.95$(Bentler & Bonett, 1980; Bollen, 1989), this is the case of this model (0.982). The good and acceptable values for the Root mean square error of approximation (RMSEA) are $0.00 \leq RMSEA \leq 0.05$ and $0.05 \leq RMSEA \leq 0.10$, respectively, in this model the score is 0.071 (Browne et al., 1993; Steiger & Lind, 1980). Then, it is possible to conclude that, in general terms, the model is suitable for analyzing the proposed problem. Nevertheless, the scale of the fit indices is not always easy to interpret (Bentler & Bonett, 1980).

The structural model results are shown in Table 6 and in Figure 4. This model is a lineal regression analysis, but can it also contain concatenated effects and loops between variables.

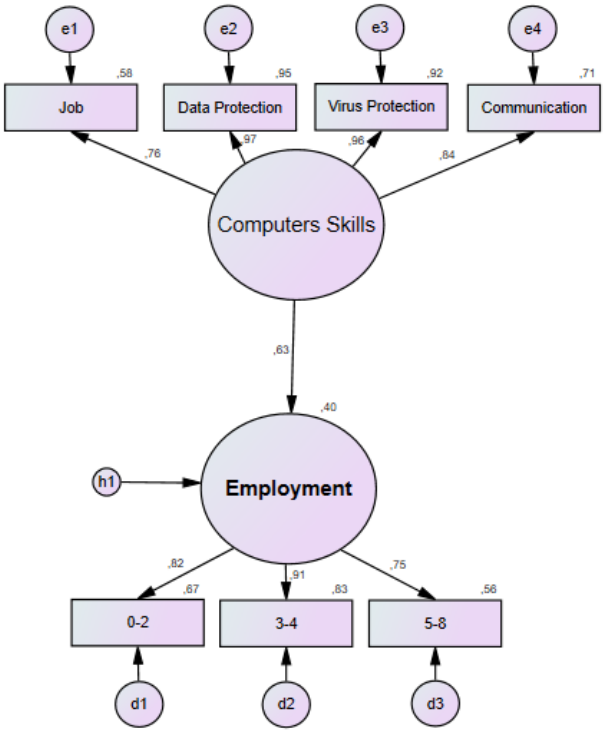
Table 6. Results for the structural model

Dependent variable	Independent variable	Estimator	Standard Estimator	Significance	R^2 fitted
Youth Employability	Youth Computers Skills	0.529	0.632	***	0.399

*** $p < 0.001$

The Employment is explained by the computers skills, which is significant ($p < 0.001$) and the fitted R2 is 0.399, then this model explains the 40 % of the youth employability in basis to their skills on computers.

Figure 4. Results



4. Discussion and conclusions

The youth living in the Euro Area countries are sensible about the importance being updated on IT knowledge, because the means comparison results indicates that there are no difference on formal learning and other ways of training, nevertheless there is statistic significant difference on the item "Individuals who have obtained IT skills through training courses and adult education centers, on own initiative", that is to say, that for the same level of knowledge, they are attending more courser by their own initiative. The means are 6.526 and 3.444, respectively, what indicates that youth in the Euro Area there are more aware on the necessity of training, since they are demanding this training courses on own initiative.

Then, the answer to the RQ1, taking account he tested hypotheses, shown in Table 7. Hypotheses results, indicates that there is an essential difference between the Euro Area and the other EU countries, and it is the one tested on H-1-5.

Despite that we conclude the rejection of five of the six tested hypotheses, is precisely the one accepted, that is to say, the H-1-6, the one that focus on awareness of the importance of ICTs skills, and it has been probed in literature (López-Arranz, 2017) to be a key factor for employability in the context of the new workplaces arising in the smart cities.

About the Research Question 2 (RQ-2) this structural modelling has proved that the skills on computers is a relevant factor to explain youth employability in the European Union and the H-2-1 should be accepted.

Table 7. Hypotheses results

RQ	Hypotheses	Result
RQ-1	H-1-1: There are differences between the Eurozone and the other European countries on awareness of the importance of IT for youth between 15 and 24 years	Rejected
	H-1-2: There are differences between the Eurozone and the other European countries on the ICTs learning for youth between 15 and 24 years	Rejected
	H-1-3: There are differences between the Eurozone and the other European countries on the internet use for youth between 15 and 24 years	Rejected
	H-1-4: There are differences between the Eurozone and the other European countries on the computers use for youth between 15 and 24 years	Rejected
	H-1-5: There are differences between the Eurozone and the other European countries on the IT skills through learning for youth between 15 and 24 years	Accepted
RQ-2	H-2-1: The Computers skills is not significant for explaining the youth 15-24 employability in the EU	Accepted

To summarize, the main conclusion of this work is that the smart cities can provide some new workplaces possibilities for those who are skilled to develop the requirements of these positions. The youth awareness of the importance of Information Technologies in general terms, and the long life learning, in particular, will be the most suitable for getting these jobs by means of being more qualified and then with a higher employability level. Boosting these educational skills among youth is recommended to policy makers to improve the youth employment levels and to provide the qualified workforce to those companies involved in the smart cities support and promotion.

References

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411.

Bacon, D. R., Sauer, P. L., & Young, M. (1995). Composite reliability in structural equations modeling. *Educational and Psychological Measurement, 55*(3), 394-406.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94.

Bentler, P. M. (1980). Multivariate analysis with latent variables: Causal modeling. *Annual Review of Psychology, 31*(1), 419-456.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*(3), 588.

Biagi, F., & Falk, M. (2017). The impact of ICT and E-commerce on employment in europe. *Journal of Policy Modeling, 39*, 1-18.

Bibri, S. E., & Krogstie, J. (2017). Smart sustainable cities of the future: An extensive interdisciplinary literature review. *Sustainable Cities and Society,*

Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research, 17*(3), 303-316.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit in KA bollen & JS long (eds.), testing structural equation models (pp. 136-162).

Browne, M. W., Cudeck, R., Bollen, K. A., & Long, J. S. (1993). Alternative ways of assessing model fit. *Sage Focus Editions, 154*, 136-136.

Browne, M. W., Structures, C., & Hawkins, I. D. (1982). Topics in applied multivariate analysis. *Covariance Structures, ,* 72-141.

Brynjolfsson, E., & McAfee, A. (2012). *Race against the machine: How the digital revolution is accelerating innovation, driving productivity, and irreversibly transforming employment and the economy* Brynjolfsson and McAfee.

Carmines, E. G., & McIver, J. P. (1981). Analyzing models with unobserved variables: Analysis of covariance structures. *Social Measurement: Current Issues, ,* 65-115.

Castells, M. (2011). *The rise of the network society: The information age: Economy, society, and culture* John Wiley & Sons.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*(3), 297-334.

Dachs, B., Hud, M., Koehler, C., & Peters, B. (2017). Innovation, creative destruction and structural change: Firm-level evidence from european countries. *Industry and Innovation, 24*(4), 346-381.

European Union. (2017). EUROSTAT. statistical information. doi:http://ec.europa.eu/eurostat/data/database

European Union. Directorate General for Internal Policies. Policy Department A: Economic and Scientific Policy. (2014). Mapping smart cities in the EU.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, ,* 39-50.

Gabrys, J. (2014). Programming environments: Environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space, 32*(1), 30-48.

Glaeser, E. L., & Berry, C. R. (2006). Why are smart places getting smarter. *Rappaport Institute/Taubman Center Policy Brief, 2*

Hair, J., Tatham, R., & Black, W. (1999). Análisis multivariante (5a) prentice hall.

Hollands, R. G. (2008). Will the real smart city please stand up? intelligent, progressive or entrepreneurial? *City, 12*(3), 303-320.

López-Arranz, M. A. (2017). The role corporate social responsibility has in the smart city project in spain. *Handbook of research on entrepreneurial development and innovation within smart cities* (pp. 439-458) IGI Global.

Lyons, G. (2016). Getting smart about urban mobility–Aligning the paradigms of smart and sustainable. *Transportation Research Part A: Policy and Practice*,

Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. *Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times*, 282-291.

Novo-Corti, I., González-Laxe, F., & Pociovalisteanu, D. (2015). The economic analysis of maritime catastrophes in sensitive areas: The assessment and calculation of damages in the environment and population's way of life. *Journal of Cleaner Production*, *107*, 267-278.

OECD. (2016). In OECD Publishing (Ed.), *Education at a glance 2016: OECD indicators,*. París, France: doi:http://dx.doi.org/10.187/eag-2016-en

Steiger, J. H., & Lind, J. C. (1980). Statistically based tests for the number of common factors. *Annual Meeting of the Psychometric Society, Iowa City, IA, 758*