The Social Sciences 11 (19): 4751-4761, 2016
ISSN: 1818-5800

Analysis of the Main ICT International Indicators and its Insidence on the Measurement of ICT Public Policies Value Chain in Society

[1]Sanchez Cespedes Juan Manuel, [2]Rodriguez Miranda, Juan Pablo and
[3]Hernandez Suarez, Cesar Augusto
[1]Department of Electronic Engineer, Faculty of Engineering,
Francisco Jose de Caldas District University, GIIRA Investigation Group, Bogota, Colombia
[2]Department of Sanitary and Environmental Engineer, Faculty of Environment and
Natural Resources, Francisco Jose de Caldas District University,
AQUAFORMAT Investigation Group, Bogota, Colombia
[3]Department of Electronic Engineer, Faculty of Technology,
Francisco Jose de Caldas District University, ARMOS Investigation Group, Bogota, Colombia

Abstract: Information and Communications Technologies (ICT) are one of the main available means to significantly contribute towards human development within a society. This is why governments have developed and implemented public policies to promote its access and use. However, they have had issues measuring its impact, due to a lack of suitable measurement tools. For that reason, this study reviews the main ICT designed indicators and its capability to measure the ITC impact, based on the public policy value chain. It also arises an adaptation to the measurement model of the ICT impact on human development and presents an example on how to design an ICT impact indicator based on a public policy. In order to attain this goals, different literature on the subject was reviewed, elaborated by the main international bodies and recognized researchers on the matter, promoting the construction of a consistent framework. Among the different results found, it was determined very little has been developed in regards to ICT impact. It was also determined that in terms of impact indicators development, these are obtained from the result indicators and their historical, in order to create the projected value and thus, determine the ICT Policy net impact. In conclusion, it turns out to be latently necessary to develop a higher ICT impact indicator amount based on the implemented ICT Policies

Key words: Value chain, indicators, public policy, ICT, impact

INTRODUCTION

Information and Telecommunication Technologies (ICT) have become an overriding tool towards human development lately. Starting at the telegraph invention by Samuel Finley Beese Morse, up to nowadays technologies like radio, television, computers, data networks, satellite communications, optical communications, Internet mobile cellulars, smartphones, etc. All of these have served as human development tools, just like it was expressed at the World Summit on the Information Society in 2003 "ICT must be considered as a means, not as an end themselves. In favorable terms, these technologies can be an effective means towards increasing productivity, generating economic growth, creating employment and fomenting employability, as well as improving life quality for all" (ITU, 2003). For this reason, many governments are currently developing public policies in regards the ITC which are aiming to promote human development within every country. Therefore, governments and international bodies as ITU, UN, UNESCO, among others have proposed different indicators related to ICT, in order to assess and determine the development of this technologies in every single country and the related public policies impact.

As it was mentioned before, based on the critical importance of ICT on human development within society and the need to measure its impact, arises this investigation project named "Impact Indicators Design on ICTs management (Francisco Jose de Caldas District University case study)" sponsored by Investigations and Scientific Development Centre at Francisco Jose de Caldas District University. This paper initially shows the conceptual framework. The theoretical fundamentals

Corresponding Author: Sanchez Cespedes Juan Manuel, Department of Electronic Engineer, Faculty of Engineering, Francisco Jose de Caldas District University, GIIRA Investigation Group, Bogota, Colombia

exposed that sustain this work are: the public policy value chain which consists of 5 linkages, inputs, activities, products, outcomes and impacts; based on the value chain, it sets 5 types of assessment: operations assessment, institutional, outcomes, impact and executive; and also applies an adaptation to the value chain according to the ICT requirements. The second conceptual pillar of the investigation is ICT impact on social development, on which ICTs must improve life quality for those individuals that compose a society which is called ICT social appropriation but this is only accomplished if the individual's digital inclusion occurs.

The methodology developed on the project, initially consisted on analyzing the main ICT indicator groups designed all around the world, based on the public policy value chain. Therefore, this paper outlines a descriptive analysis of this ICT indicators and their classification. The results obtained show the lack of impact indicators. Later, different ICT impact measurement models in society were reviewed and were made an adaptation in order to match the raised needs, this adaptation is outlined in the article. Finally and example is presented on the TIC impact indicator design, based on the adapted methodology.

Conceptual framework: This paragraph conceptually and theoretically reviews the main subjects on which this investigation is based. It starts with the public policy value chain, proposed by the National Planning Departmentin 2014 and the types of assessment upon this and explains how its application would be in case they were ICT policies; to conclude the conceptual framework, the ITC´s technologies and human development relation is outlined.

Public policy value chain: The outlined public policy value chain was designed by the Public Policies Tracking and Assessment Directorate (PPTED) from the National Planning Department (NPD), aiming to set a methodological guide, on which Sinergia (Management and Results Assessment National System) performs both tracking and assessment which results in the feedback and strengthening of public policies as mechanisms that create public value. (NPD, 2014) Public policy value chain shown in Fig. 1, presents the link by link process where value is added, in order to attain the final result. The public policy value chain consists of 5 links, explained as follows:

Inputs: "Productive factors, goods or services available for creating value". These can be financial, human, legal, capital-type, etc." (NPD, 2014).

Fig. 1: Public policy value chain (NPD, 2014)

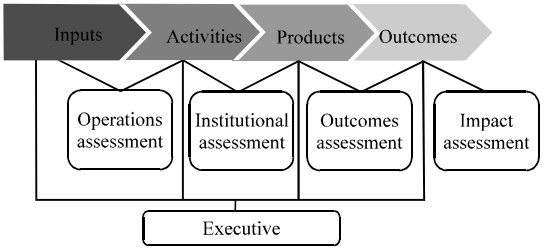

Fig. 2: Assessment types in the value chain (NPD, 2014)

Activities: "Group of processes or operations through which value is created by using the inputs, giving place to a certain product" (NPD, 2014).

Product: "Goods and services given by the State, obtained out the inputs transformation through the activities execution" (NPD, 2014).

Outcomes: "Effects related to public intervention, once the given products have been consumed by it. The effects can be intentional or not and/or attributable or not to public intervention (NPD, 2014).

Impact: "Effects exclusively attributable to public intervention (NPD, 2014).

Taking as a basis the public policy value chain, the different indicators that measure each of the links in the value chain are set (inputs, activities, products, outcomes and impacts), on which the most relevant of them and for this analysis are: products and outcomes, impacts ones are included within the outcomes but in a more specific nature. Based on the value chain and its indicators, different types of assessment can be set as shown in Fig. 2. As observed, there are 4 types of assessment from which three types can be grouped into a single one called executive assessment and a fourth type of assessment which is impact-type. Objectives of each are presented as follows.

Executive: "Establishes analysis and specific adjustment proposals about the main aspects of the program being reviewed. Design, Outcomes, Inputs, Operations Management organizational structure, Addressing Activities, Tracking and Control" (NPD, 2014).

Operations: "Systematically analyzes the way a public intervention operates and how its processes lead to

Table 1: Links of the ict policy value chain

Link	Description
ICT inputs	All resources available for value creation through ICT products. These can be financial-type, human capital-type, legal-type, capital-type, etc.
ICT processes	Organized set of practices and activities to attain certain objectives and produces a set of outcomes that support the goals proposed in the ITC policy
ICT products	ICT goods and services provided, obtained from the inputs transformation through processes execution
ICT outcomes	Added value created by the ICT, once the products provided by it have been consumed. These correspond to the ICT social appropriation level in cultural, socio-economic and politic aspects on individuals who were applied the ICT policy. The effects can be intentional or not and/or attributable or not to the ICT policy
ICT impacts	Effects exclusively attributable to ICT policy

NPD (2014), ISACA (2012)

attaining its objectives. It identifies the relations each of the activities requires to produce a good or service" (NPD, 2014).

Institutional: "Allows analyzing and assess a program, considering as framework the institutional settlement on which it operates. It studies the reasons why institutional capability fails in the intervention programs, to provide the inputs to enhance the management and give the goods or services in a more effective manner" (NPD, 2014).

Outcomes: "Determines the public intervention intentional or non-intentional effects, once the products have been consumed. These effects must be related to public intervention" (NPD, 2014).

Impact: "Allows identifying the effects exclusively attributable to public intervention. Impacts measurement allows to quantify and verify the causality relation among public intervention and the result" (NPD, 2014).

For the indicators analysis process, it will be taken as main classification whether the type of assessment to perform is executive-type or impact-type which is suitable for the study objectives. Based on the public policy value chain ICT policy value chain can be particularized and established, where its main differences are that the products created refer to products on Information and Telecommunication Technologies-ICT and the outcomes and impacts refer to ICT appropriation level. The description of each ICT link from the ICT policy value chain is presented in Table 1.

ICTs and social development: As it was already mentioned before, ICTs more than an end, are a means or a tool that serve as catalyst in economic and social development. But ICTs and economic and social development are not necessarily related in a positive way, therefore, ICTs growth can also cause an increment of poverty and social inequality. For this reason, it is important to implement technology aiming to serve social development.In the World Summit on the Information Society, held on December 21st 2001, some statements were made that help to a better understanding on the role ICTs play in society. This statements can be summarized as follows:

- ICTs strongly impact every single aspect in our lifes. Therefore, they can contribute to reach high development levels and reduce obstacles such as time and distance
- ICTs must be considered a means, not an end in itself which must be an instrument to improve everyone´s life quality
- ICTs must help women play a key role in Information Society
- ICTs must be supporting instruments for the poor that help them get out of poverty
- ICTs must attempt to create benefits in all areas of daily life (ITU, 2003)

In conclusion, ICTs as a means and not as an end, must be used to improve individuals' life quality and therefore, improve society´s development levels. This concept is called ICT social appropriation, defined by López de Mesa as: "ICTs' efficient and productive use, to improve social inclusion and increase competitiveness." (Lopez, 2010)

For this reason, ICTs' social appropriation must promote cultural, socio-economical and politic aspects aiming to benefit society and individuals' development and therefore, their own freedom (Eclac, 2007). But in order to ensure ICT social appropriation to occur, it´s necessary there to be what Sanchez Vegas called: digital inclusion, he defined digital inclusion as "the access to technological benefits, to digital content in networks, to the information for creating knowledge and value addition, it means incorporating ICTs from their social relevance, meaning their incorporation to the daily processes of most dwellers, aiming to form informed individuals and citizens that are critic and productive, in order to constantly improve their life quality and therefore, to effectively deepen social inclusion and equity". This means that in order to attain social inclusion of the individuals who make up a society it´s necessary to ensure their access and training on ICT tools use. For this, Pineda suggests the necessity to train communities, through formal and informal education on this tools,

developing autochthonous educational content, the consolidation of free software national proposals and educational e-learning alternatives. That is why ICT policies created by different governments must ensure digital inclusion and must be one of their strategic axis within their government plans, as raised by Lopez and Samek (2009) "Digital inclusion, placed as a fundamental topic in the agenda for social justice and human rights, can foment new scenarios for tolerance y comprehension". This digital inclusion process will also help to reduce the digital gap defined by Serrano and Martinez as "Digital gap is defined as the existing separation between people (communities, States, Countries…) that use Information and Communication Technologies (ICT) as a routine in their daily life and those who have no access to them or do not know how to use them although they have them (Serrano and Martinez, 2003).

MATERIALS AND METHODS

The methodology developed to achieve the investigation goal, has various stages. The first one consisted of a review of the theoretical fundamentals that sustain the investigation which helped obtaining the conceptual framework. The second stage aims to gathering the main ICT indicators developed and analyze them based on the ICTs value chain presented on the conceptual framework. The third stage was analyzing the measurement model of ICTs on social development. Based on the analysis, an adaptation of the most suitable model came up to be the fourth stage. As a final step, a design example of ICT impact indicator is presented, based on the adapted model which serves as a guide for designing this type of indicators. As follows, each stage is explained in detail and graphically described on Fig. 3.

Theoretical review: This review consisted of a conceptual revision of the main concepts such as ICT, public policy value chain and the relation between ICTs and society and how ICTs must contribute to the development of those individuals who make up a society. Based on those concepts it is possible to postulate the ICT public policies value chain describing the objectives of each link and additionally present the management indicators role to measure this value chain.

Review and analysis of ICT indicators: Considering the ICT indicators the value chain proposed, there´s a review of the main ICT indicators proposed by the most recognized international bodies as the ITU (International Telecommunication Union), UN (United Nations) and UNESCO (United Nations Educational, Scientific and

Fig. 3: Methodology applied

Cultural Organization). This review and analysis consisted of a statistical descriptive study of 200 ICT indicators, taken as the study simple. On this descriptive analysis different indicators were classified according to the typology proposed. The analysis result allowed to identify if the indicators proposed by these organizations were able to make an executive assessment and if they're able to measure the ICT policies impact on social development.

Review of ICT impact measurement models: On this stage, there is an analysis of the measurement model proposed by the United Nations Workforce for ICTs and the model proposed by Enrique Crespo from Polytechnic University of Madrid was reviewed as well, where the strengths and weaknesses of this models were identified, to measure the impact of ICTs on society development.

Adaptation of the ICT impact measurement model: Based on the results obtained on the review of the ICT impact measurement models and the theoretical concepts that this investigation is based on which are exposed in the conceptual framework, an adaptation was developed for the ICT Impact measurement models in order to measure in detail ICTs social appropriation level and therefore, determine the best impact of ICTs.

Design of the ICT impact indicator: As a final stage an example was made upon the design process of an ICT impact indicator, according to the ICT impact measurement model adaptation obtained on the previous stage, thereby, serve as a reference for creating this indicators that are according to the policy to be measured. For the indicator design, as an example the "Live Digital Plan 2010-2014" by the Information and Communications Technologies Ministry of Colombian's government was taken.

RESULTS AND DISCUSSION

This chapter presents the groups of index and indicators analyzed and the results obtained when applying the methodology proposed and the respective analysis of the results obtained. The indicators analyzed were: index DAI, OI-ICT, IDI, TPB and indicators ICT proposed by Partnership group to measure the ICTs for development of UN and UNESCO.

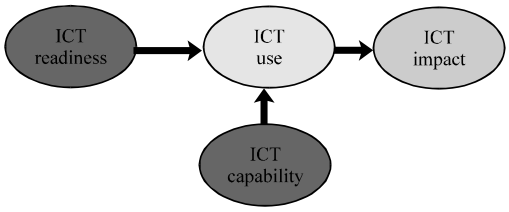

Fig. 4: ICT development index conceptual framework

Table 2: Classification results of DAI indicators

Inputs	Process	Products	Outcomes	Impacts
3	-	5	-	-

Table 3: Classification results of OI-ICT indicators

Inputs	Process	Products	Outcomes	Impacts
2	-	8	-	-

Digital Access Index (DAI): This index was designed aiming to measure the total capability all citizens in a country have to access and use the ICTs. This was designed based on four fundamental factors: Infrastructure, affordability, knowledge and quality, where the base factor is infrastructure but when there's a lack of the other three: quality, knowledge and affordability, there can´t be access to ICTs. Figure 4 describes the measurement model (ITU, 2003). Table 2 present results of the descriptive analysis made to the index indicators. Being an index that aims to measure the access capability, it was evident that the indicators that conform it are input and product-type. Therefore, it is clear that it must not have result-type indicators nor impact ones which originate from outcomes. Nor are there process-type indicators but that is not an issue due to what this index aims to. But in case of making a full assessment of a policy, it would indicate that besides using the DAI index, it is necessary to complement them with Process indicators in order to determine the great resource management on developing the policies and their projects. Additionally, it is necessary to use outcomes and impacts indicators in order to determine ICTs social appropriation level on individuals affected by the policy.It is also clear the because of the index´ structure and components, this only allows making one partial executive assessment of the policy and not about its impact.

Opportunity Index of Information and Communications Technologies (OI-ICT): This indicator aims to identifying the possible opportunities through the ICT in society. Considering the access and use of ICTs and also identifying the opportunities that come up from the ICTs, based on the dual concept that the ICTs have as a production and consumable good, where it establishes the concept of ICTs opportunities, this depend on the info-density and info-use level (ITU, 2003).

Table 4: IDI classification indicators summary

Inputs	Process	Products	Outcomes	Impacts
3	-	8	-	-

Info-density: These are the production abilities and the economy capacity in terms of ITC´s workforce and ICT capital (ITU, 2003).

Info-use: It is the consumption or use of ICT in society (ITU, 2003).

Indicators of this index are grouped into 4 blocks, according to the conceptual framework (Infrastructure, abilities, appropriation, use intensity) which helps obtaining four sub-index (ITU, 2012). Results according to their classification are presented on Table 3. Considering that the OI-ICT aims to identify the possible opportunities through the ICTs in society, the indicators that mainly conform them are products and input-type, because the products are clearly the source of such opportunities and the inputs determine the potential to access these ICT products. But unfortunately, there are no indicators that are able to measure whether this opportunities that can be presented by the ICTs are exploited or not. In order to measure and determine if the opportunities that can be created by the ICTs are actually exploited by all individuals who make up that society, it turns out to be necessary to determine the digital inclusion level within a group of individuals affected by the policies and also determine the integration level of the ICT tools on their daily labors, on political, socio-economic and cultural aspects. Therefore, it would be necessary to add outcomes and impact indicators which are the most suitable to measure this aspects.In conclusion, the OI-ICT index, only allows to make a barely executive assessment and not of impact on ICT policies in society.

ITC Development Index (IDI): The ITC Development Index (IDI), aims to monitoring and comparing ICT development in countries and measuring evolution of the digital gap in the world. Based on this main objective, three secondary objectives come up which measure ITU, 2003).

- The level and chronological evolution of ICT development in countries compared to other countries
- ICT development progress in developed and developing countries
- The digital gap, meaning the differences among the countries with different ICT development levels. This index is made of eleven (11) indicators

The index construction is based on the model described on Fig. 4. The model describes ICT

development and the transformation of countries in information societies which are based on three main components. The first component is ICT readiness which refers to the infrastructure and access level of ICT available; the second component is ICT capability, this one adduces the skills individuals have to use and take advantage of ICTs, the last component is ICT use which describes the ICT use intensity in society. Improvement on this three components, ICT availability, ICT high use and the capability to efficiently use ICTs; certify a positive impact of ICTs in society and contribute to countries transformation in Information societies (ITU, 2012). Table 4 present the classification results. The 73% of indicators conforming the IDI index are product-type and 27% are input-type. Same as previous index, these are mainly constructed by this type of indicators although it could be expected that the index had any result-type indicator but this is not happening, because of the conceptual model on which this index is based. This model suggests that a suitable development of the three components of the model ensure a positive impact for the ICTs in society which cannot be granted until digital inclusion is ensured and therefore, ICTs social appropriation and that way they contribute to human development. For this reason, as previous scenarios, IDI index only allows making an executive-type assessment.

ICT Price basket TIC (IPB): This index aims to determine the impact from ICTs price on demand and their diffusion within a society. This is why a world referenced tool is used which provides detailed information about the cost and affordability of fixed telephone, Mobile cellular and fixed broadband. (International Telecommunications Union-ITU, 2007) The IPB index is constructed by three price types that refer to three sub-baskets (fixed telephone, Mobile cellular, fixed broadband) this index is calculated with the sum of each sub-basket price in dollars which are a monthly percentage per capita divided by 3. The calculation is observed on Fig. 5.

This index is constituted by 3 indicators that measure the access capability to the ICT products, based on the commercial price of these products, taking as a reference the net gross income per capita and this is why it can be assured that these are product-type indicators. Moreover, this index´ objective does not ever contemplate measuring ICT impact but ICT price impact which is a completely different scope. For this reason, this index only allows to perform an executive assessment.

Table 5: Resultados de classification of partnership 2010 indicators results

Inputs	Process	Products	Outcomes	Impacts
3	-	40	3	-

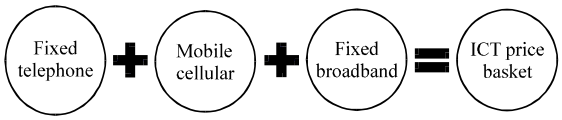

Fig. 5: ICT Price Basket (IPB)

Key indicators of information and communications technologies-partnership for the measurement of ict for developmento-2010: he development of this indicators arises from the concern of having an instrument to measure ICTs use that serves to postulate policies in regards to ICTs on which cohesion and social inclusion are benefited and where there can be tracking and assessment on the effects of those technologies in economic and social growth.

There are two versions of this document, 2005 and 2010 versions. On 2010's version, 46 ICT and two reference indicators are presented. The indicators are classified in 6 groups that are: access and infrastructure measurement, home and people access and use, ICT use, ICT international trading, ICT productive sector and ICT on the educational area. The consolidated for indicators categorization can be observed on Table 5. Clearly, the Partnership 2010 indicators manual, is the most complete document yet. It contains 40 indicators that are capable of measuring the ICT products of the public policies related, this is 86,96% of the indicators proposed and it only has 6,52% measuring the ICT inputs. But there are three indicators that measure outcomes which would be capable of measuring the ITC impact as long as the effect of other factors is isolated. Although proportionally these are very few which is equivalent to 6.52%, they turn into the first efforts for determining the ICT impact on individuals and companies and thus, provide the first evidence of ITC impact and social appropriation of these. This data would indicate that the indicators proposed by Partnership would mostly be capable of making an excellent executive assessment and instead they would make a superficial impact assessment, on which two indicators assess ITC's impact on the company sales and only one on the ICT use in the individual, where he would be necessary in order to improve the impact assessment, discriminate and deepen the ITC appropriation level in the individual, in cultural, socio-economic and political aspects and additionally measure the benefits obtained for his life quality. Being

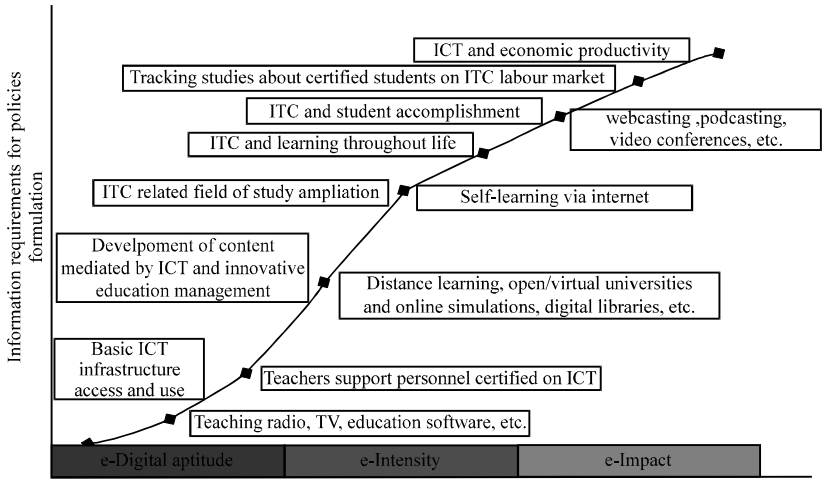

Fig. 6: Evolution of information requirements versus ict integration level

very few outcomes indicators proposed, the Task Force Partnership of Measuring ICT for Development group raises the need to develop in later versions, ICT impact indicators.

Information and Communications Technologies (ICT) on education measurement manual-UNESCO 2009: The manual suggests that indicators must adapt to each country´s needs, recognizing the ICT integration level on the educational system. Also, they should be capable of monitoring the progress on ITC policies. For this reason, it establishes the evolution of information requirements versus ICT integration level; this relation can be observed on Fig. 6. Based on the relation among the information requirements and the integration level of ICT on the educational system, it sets the indicators design, the need to define common interest domains among public policy formulators and thus, create indicators that allow to measure evolution on each domain. These are the domains proposed:

- Political engagement
- Infrastructure
- Teaching personnel development
- Curriculum
- Use
- Participation, competences and performance
- Outcomes and impact

Alongside these domains, there is a basic indicators list for measuring ICT public policies on education. Total results of indicators categorization can be observed on Table 6 in regards to the basic indicators group proposed

Table 6: classification results of basic indicators UNESCO 2009

Inputs	Process	Products	Outcomes	Impacts
19	4	36	-	-

by UNESCO it can be affirmed that: nineteen out of fifty nine indicators are input-type which correspond to 32% of the total indicators which means this manual serves as a significant tool for input type indicators creation, because so far, from the indicators analyzed, none of them has shown that amount of this indicators type. When observing the other indicators, four out of fifty nine indicators from the 6.8% indicators group, measure the process efficiency which are an important information tool to determine the implementation and policy development efficiency, this group of indicators has not been appreciated on previous analysis but there is no relative relevance either on measuring this characteristic from the Manual proposed by UNESCO. Finally, thirty six out of fifty nine indicators corresponding to 61.0% of the indicators measure products which being compared by percentage and volume with those proposed by UN's Partnership group are a little bit lower but as UN's indicators, they become a high importance input when constructing ICT indicators in educational area. However, once again it outlines the problem from previous documents analyzed; the lack of development on outcomes indicators that allow to measure the fulfillment of the objectives proposed by ICT policies and therefore, determine ICT impact on social development. The main reason for this is that when analyzing the conceptual frameworks on which most manuals are based, they don't consider the social appropriation level of ICT in daily life of individuals being affected by these technologies.

Table 7: Classification results of supplementary indicators unesco 2009

Inputs	Process	Products	Outcomes	Impacts
14	6	38	5	-

In conclusion, UNESCOs manual allows making an excellent executive assessment of ICT policies implemented on the education sector but it doesn't have any elements that contribute on assessing these policies impact. In the other hand, besides designing and presenting a group of basic indicators, UNESCO also presents a supplementary group, the reason for this additional group to be is the high amount of bodies that participate in the education sector. But it´s also clear that these indicators demand a higher development for their implementation. Table 7 shows the consolidation of the results obtained from the categorization.When reviewing the data obtained from categorizing the supplementary indicators from UNESCO's Manual, it's determined that thirty eight out of sixty three indicators are for measuring ICT chain value products which equals 60.3%, this is why it can be established that this group of indicators presents the same tendency as international indicators already revised which means measuring the products that produce the ICT policies application; this repetitive situation does not mean it's a problem, due to the high importance it implies on creating these products, because those are the measurable set goal when implementing projects that in practice, execute the policy. However, it's necessary to measure the ICT social appropriation level which would be the outcomes and therefore, the impacts of ICT policies, so that it can be determined if ICT products are attaining their final goal within social development, because in case there´s no relation found between product indicators and outcomes and impacts indicators, it could be assured there are issues on digital inclusion of the total individuals that integrate the society and would provide alarm signs on the policy execution which would set the path for modifying or formulating new policies capable of attaining those technologies final objective. Under this premise, it will be observed if the supplementary indicators have a significant outcomes indicators group compared to the product ones but only five out of sixty three which equals 7.9% of the total supplementary indicators group are outcomes-type which is quite a low number compared to the thirty eight product-type it has, so this is why it confirms the need to design a higher amount of this indicators type, by UNESCO and by the governments that use it as a guide for measuring their policies. In regards to the other links in the value chain, it can be observed that fourteen out of sixty three are input indicators which is proportionally a suitable amount for analyzing this value chain link, moreover, as it was observed, it

Table 8: Comparison of indicators classified based on the value chain

	Indicators classification				
ICT indicators	Inputs	Process	Products	Outcomes	Impacts
DAI	3	-	5	-	-
OI-ICT	2	-	8	-	-
IDI	3	-	8	-	-
IPB	-	-	3	-	-
Partnership-2010	3	-	40	3	-
UNESCO-2009	19	4	36	-	-
UNESCO-2009 Suplem	14	6	38	5	-
Totals	44	10	138	8	-

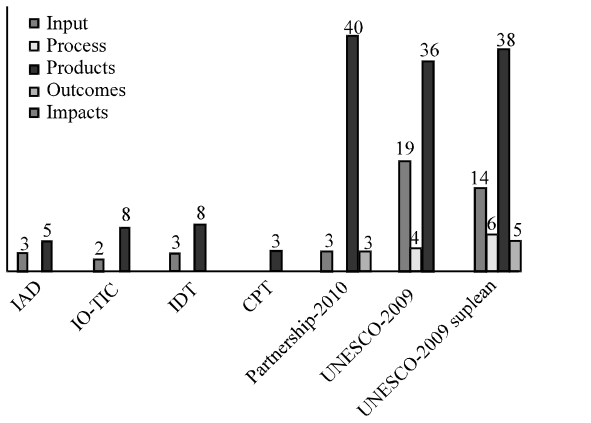

Fig. 7: Comparative chart of indicators classified based on the value chain

helps to determine the politic willingness level from governments on this aspects. Finally, it can also be observed that six out sixty three, corresponds to process indicators which is 9,5% from the indicators group, this could lead to say that the indicators amount and proportion is very low but the manual aims to establish a guide for countries and therefore, they can adapt according to the ICT integration level on the education system. Moreover, the process indicators group measures the efficiency in terms of time and money on products production, this is why it can be concluded that this indicators must be designed by countries and governments according to their environment. Lastly, as in previous cases, UNESCO´s Manual in the supplementary indicators group serves to make an executive assessment of ICT policies in education but not for making an impact assessment.

Comparative analysis of ICT indicators: Table 8 and Fig. 7 show a comparison of different indicators classified based on the public policy value chainSource: Authors By observing the comparative graphic of the different indicators, the following can be concluded: Different internationl bodies concern is denoted of measuring the ICT products created by the related policies this is why 138 indicators out of two hundred analyzed (138/200).

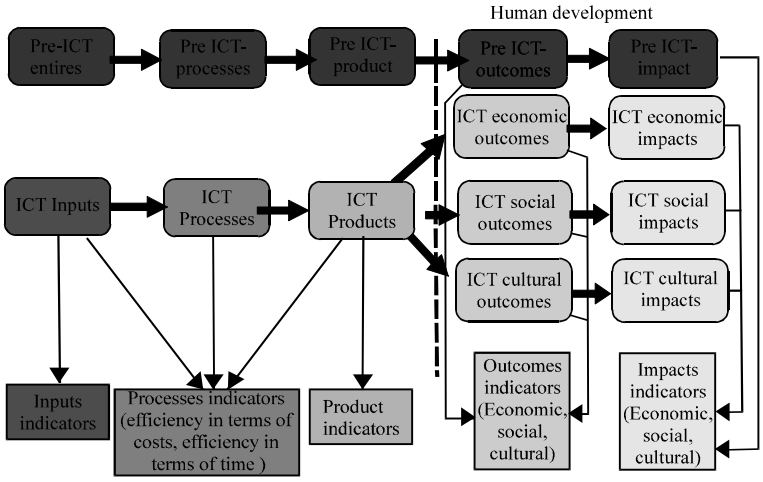

Fig. 8: Adaptation to the impact measurement model of ICT on human development

correspond to this type which is 69% out of the total indicators. This is because those are the first-hand and easiest proof for measuring an ICT policy development.Another indicator type that reflects a high development is the inputs one which corresponds to forty four indicators out of two hundred analyzed (44/200), this is 22% out of all indicators analyzed. The reason for this development is that it´s possible to produce ICT products through inputs, therefore, an appropriate disposition of these ensures an increase on the probability of the ICT products creation and thus, of the expected outcomes when consuming those products, in the individual´s progress and hence, society´s progress.On Process indicators development, it can be observed that their progress is quite low, where only ten out two hundred indicators (10/200) correspond to this type which is 5% of the total which is proportionally very low. The reason for this can be based on the low concern shared by international bodies when reviewing the ICT products production process, analyzing their efficiency in terms of time and costs; hence, this concern should be addressed to the ICT policies executers, in every country where these are implemented, because this a high relevance aspect for them, in order to ensure a better resource exploitation.It´s clear that developing indicators capable of measuring the result and hence the impact has been practically null, this corresponds to 4% of the total analyzed. The reasons why this happens are: The theoretical models on which the indicators created by the international bodies are based, establish that by ensuring the optimum ICT policy process functioning, starting at the inputs until the product creation, significantly contributes to obtain positive outcomes and impacts in society development. There is also a problem that is not considered on theoretical models, about how to measure the ICT social appropriation level, although they establish that ICT, more than an end, are a means to attaining this purpose. It is clear that there are no impact indicators perceived, due to the high difficulty for measuring this aspect, for two reasons mainly, the first one is that for measuring impact it´s necessary to take a sample in a considerable period of time (higher than five years) that is capable of evidencing the real project impact on community and thus, determine whether it was beneficial or not and the second reason is that in order to measure the actual impact it is necessary to isolate the effects from other factors that can contribute to the outcomes obtained and which are not part of the ICT policy implemented. A possible solution to this problem is to identify what the outcomes would have been if that policy had not been implemented and thus, discount it from the evidenced result and get to determine the net impact, as proposed by Enrique Crespo on his Guide for analyzing the impact of information and communication technologies in human development (Crespo, 2008).

Adapation to the impact measurement model of ICT human development in regards to the value chain: An ICT impact measurement model is presented as an adaptation of the model proposed by the work group of United Nations in terms of ICT called "UN ICT Task Force" and the association for ICT measurement on development also presented by Enrique Crespo (Crespo, 2008) and these models adjusted to the ICT policies value chain previously explained. This adapted model can be observed on Fig. 8. It is necessary to clarify the most relevant adjustments from the adapted model which are:

The theoretical models on which the indicators created by the international bodies are based, establish that when ensuring the optimum ICT policy process functioning from the inputs until product creation, it significantly contributes to obtain positive impacts and outcomes in society´s development. Another problem is found on theoretical models which don't consider how to measure the ICT social appropriation level, although they establish that ICT, more than an end are a means to attaining this purpose.

There were some sub-type indicators created about efficiency in terms of costs and time on processes indicators. Outcomes and impacts indicators were subdivided into cultural, economic and social, the main reason for this subdivision is ICT's main purpose which is to foment social development which can be attained with their social appropriation, understood as "practice use, daily, skills that foment social, cultural and economic development through ICT" and this way, perform a more detailed measurement of ICT policies impact behavior.5.4.In regards to the Pre-ICT value chain, it aims to determine the possible impact of previous ICT policies in case the new ICT policy has not been implemented. In order to attain this, it is necessary to make measurements prior to the new ICT policy implementation and based on these, forecasting the temporal spot where the impact should be measured. The model does not show indicators that measure Pre-ICT inputs, processes and products, because these are management-type and there's no intention of measuring them under the set target, nor does it make sense because it is a policy that was previously implemented. Considering the adapted model as a basis, there will be an example presented of the ICT impact indicator design

Example for constructing an ICT public policies measurement impact indicator: In order to present this example, there will be an indicator that helps measuring one impact aspect from Live Digital Plan 2010-2014, the objective of this plan is to promote Internet use massification and technology appropriation, ICT direct and indirect employment creation, we will manage to reduce unemployment, reduce poverty, increase the country competitiveness and take a leap forward Democratic Prosperity.

It's clear that for developing impact indicators, in first instance, we can use the products indicators out of which we can deduct the one for expected result and therefore, the impact one which must measure the ICT social appropriation level in one of the three dimensions (Economic, social and cultural). Hence, there will initially be a product indicator according to the objective from Live Digital Plan 2010-2014, this indicator:

Number of new ICT Jobs created in 2014: This is a product-type indicator and must not be considered a result-type indicator, because some outcomes expected when consuming these products is to diminish unemployment or reduce poverty, therefore, the result-type indicator would be a derivation of this one which should be:

ICTIIV: Income increment value generated by implementing this new ICT use in 2014 discounting inflation.

This also aims to state that the gathered data for the result indicator must only be applied to those that meet the affirmative condition of the product indicator they depend on.Constructing the result indicator would imply the product and result indicators previously mentioned must have been implemented earlier than 2010, meaning those years prior to the new policy which would help obtaining the numeral for the projected value from the increase on created income by being applied to the new ICT use in 2014 discounting inflation (ICTPIV). With this projected value, the obtained value would be discounted from the result indicator proposed and it could measure the impact of Live Digital Plan 2010-2014 in this aspect. Hence, the impact indicator can be:

[(ICTIIV)-(ICTPIV)]/(ICTPIV)]*100%: This indicator could measure the actual impact of Live Digital Plan 2010-2014 in the economic aspect. Although it's not possible to apply this indicator because it would be necessary to design the question within the survey and apply it, necessary elements can be evidenced on designing an ICT impact indicator, these are: every policy is based the products to be produced with the policy and the expected outcomes from this which is the main development input for impact indicators. Outcomes indicators must be related to the products in order to verify the gathered data validity. Impact indicators come from outcomes indicators and their historic in order to create the value projected and thus, determine the net result for the ICT policy, meaning the impact.

CONCLUSSION

Being ICT a means and not an end, they must be utilized in order to improve life quality of individuals and therefore, enhance development levels in society. This concept is called ICT social appropriation which must promote cultural, socio-economic and political aspects aiming to benefit society´s and individuals development and hence, their own liberty. But, in order to ensure ICT social appropriation attainment, it´s necessary there is digital inclusion and for this, it's necessary that those

individuals who make up a society have access and training on the usage of ICT tools. It's necessary to use outcomes and impacts indicators in order to determine the ICT social appropriation level on those individuals affected by the policy and also those who determine society´s digital inclusion level.It's necessary to develop a higher amount of ICT impact indicators based on the public policies implemented.The conceptual frameworks on which most manuals are based, do not consider the ICT social appropriation level in daily life of those individuals affected by this technologies.It is clear there is a concern from international bodies on measuring the ICT inputs and products, this is because when measuring inputs, it was possible to determine a chance to create products and products are its immediate and simplest evidence to measure, in the policies execution and operation process, developed through the projects it´s sustained on.

Most indicators developed allow to make an executive assessment and very few make an impact assessment. This is due to the complexity for it to be measured, since it would be necessary to isolate other factors effects, that can contribute to the results obtained and do not belong to the ICT policy implemented.Outcomes indicators must be related to the products in order to verify the gathered information validity.In order to obtain the numeral of the impact indicators, it is mandatory to have the historic values from the outcomes indicators that sustain the respective impact indicator according to the policy to be measured.

REFERENCES

Crespo, E., 2008. Guide for Analyzing the Impacto of Information and Communication Technologies on Human Development. Polytechnic University of Madrid, Santiago, Chile.

Eclac, 2007. Social Cohesion, Social Inclusion and Sense of Belonging in Latin America and the Caribbean. United Nations, Santiago,Chile, Pages: 87.

ISACA, 2012. COBIT 5.0: Business Framework of Government and Company Management. ISACA, Rolling Meadows, Illinois.

ITU, 2003. Building the Information. World Summut on the Information Society (WSIS), Ginebra, Mandaluyong, Philippines.

ITU, 2012. Measuring the Information Society 2012. International Telecommunications Union, India, ISBN: 9789261140717, Pages: 226.

Lopez, D.M.C.P., 2010. Assessment of public policies impacto on ICT social, case Medellin. Antioquia Department, Medellin, Colombia.

Lopez, L.P. and T. Samek, 2009. Digital inclusion: A new human. Educ. Lib., 192: 114-118.

NPD, 2014. Methodologic Guide for Tracking and Assesing Public Policies. National Planning Department, Bogota, Colombia.

Serrano, A. and E. Martinez, 2003. The Digital Gap: Myths and Realities. Autonomous University of Baja California, Mexucali, Mexico.