



**ASSOCIATION OF TELECOMMUNICATION COMPANIES
OF THE ANDEAN COMMUNITY
ASETA**

**THEMATIC MEETING OF THE WORLD SUMMIT ON THE
SOCIETY INFORMATION : "EVALUATING THE
INFORMATION SOCIETY"**

**WORLD TELECOMMUNICATION / ICT INDICATORS
MEETING**

**MODEL TO QUANTIFY
THE DIGITAL GAP**

Geneva, Switzerland, 7 - 11 February, 2005

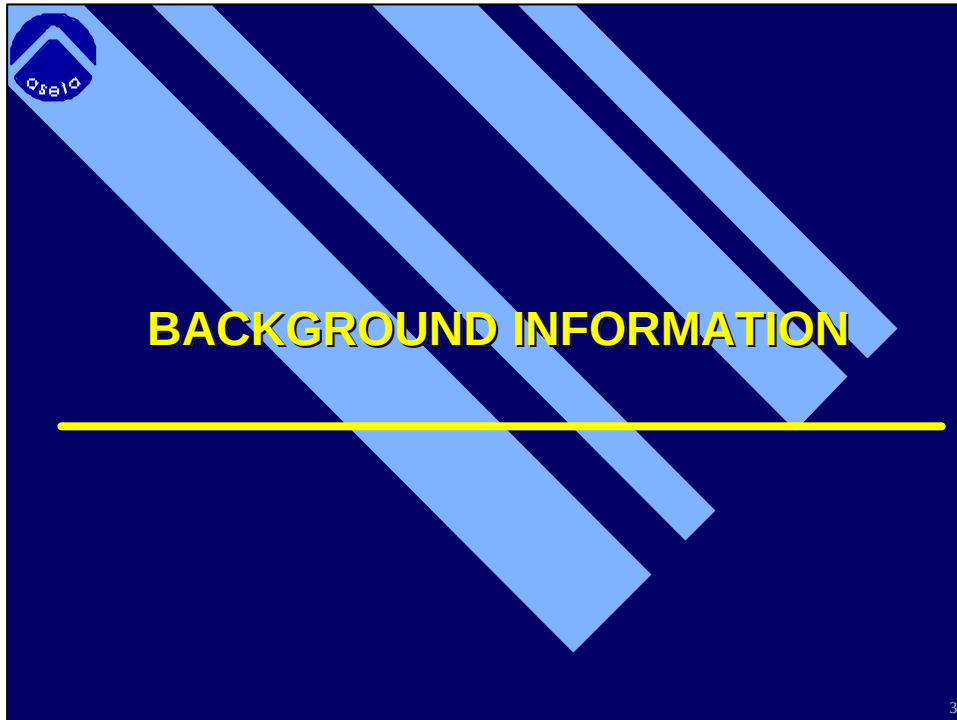
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- BACKGROUND INFORMATION
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MODEL TO QUANTIFY THE DIGITAL GAP

BACKGROUND INFORMATION

This document seeks to contribute to the development of one of the **key aspects of the Action Plan**, entered into by the Heads of State and representatives of the countries of the world at the **First Phase of the World Summit on the Information Society**. The Action Plan took place in Geneva, Switzerland in December, 2003, and was devoted to **evaluating results and establishing international quantitative and qualitative references** through the use of comparable statistical indicators that clearly show the magnitude of the Digital Gap. (Action Plan CMSI – 03 – Letter E – Follow-up and Evaluation).

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METHODOLOGY

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METHODOLOGY

The method is based on the model created by ASETA in 2002 to evaluate the Digital Gap; but this time, a deeper consideration on its structure, calculation and mathematical support has been given.

Because of the significant impact they have on a country's development, the following variables were identified: social and economic variables, access to telecommunication and information-technology infrastructure, development, contents and applications, and competitiveness, all of which are connected with the Information Society.

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METHODOLOGY

We researched the existence of indicators of reliable sources which should be directly related to the variables. Then, we selected those for which there is updated information in the world.

The Main Component Analysis (ACP in Spanish) was used as a basic mathematical method for the study.

The SPSS program (Statistical Product and Service Solutions) v.12.01 was used as a calculation tool for developing the model.

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METHODOLOGY

The results for each indicator that plays a role in quantifying the Digital Gap are shown in sorted tables – from greatest to smallest- for all the 175 countries considered, especially those in Latin America, the Caribbean and those belonging to the Andean Community.

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CONTENTS		
1. INFORMATION SOCIETY - Background Information. - ICT impact. - Principles. - Global and regional actions.	2. DIGITAL GAP - Concept of Digital Gap. - Action Plan of the CMSI First Phase.	3. MATHEMATICAL MODEL. - Model Elements. - Multivariate Statistical Technique – Main Component Analysis (ACP in Spanish).
4. EVALUATING THE DIGITAL GAP - Indicators and variables. - IDH - ITB - IAI - IDC - NDD - BD	5. CONCLUSIONS AND RECOMMENDATIONS - Conclusions - Recommendations	6. ATTACHMENTS - Tables of data used in the study

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CONTENTS
Chapter I presents the background information and principles of the Information Society, and the impact of the Information and Communication Technologies – ICT on the social organizations, and the global actions being carried out on this matter by the States and International Institutions. Chapter II refers to the concept of Digital Gap associated to the use and application of the ICT, including an analysis of each one of the aspects of the Action Plan entered into by the Heads of States and representatives of the countries that attended the first phase of the World Summit on the Information Society, held in December 2003, whose application shall contribute to eliminate the Digital Gap .

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Chapter III presents the following elements to be considered for the establishment of a mathematical model that will allow for the quantification of the Digital Gap: users, infrastructure, contents, services, applications and environment . The multivariate statistical methodology called Main Component Analysis (ACP in Spanish) is described, which is the method used to model the selected variables and to create the indicators that will be utilized to quantify the Digital Gap.

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Chapter IV applies the Main Component Analysis for the preparation of the models that take part in the quantification of the Digital Gap. The following models are sequentially obtained: the Human Development Index (IDH in Spanish); the Basic Telecommunications Index (ITB in Spanish); the Internet Access Index (IAI in Spanish); the Competitive Development Index (IDC in Spanish); and the Digital Development Level (NDD in Spanish), which is used for the final quantification of the Digital Gap.

Each index is rated as a part of the set of 175 countries considered. Also, the variables are graphically represented for their analysis and interpretation. The case of the Latin American and Caribbean countries has been considered and the members of the Andean Community have been particularly represented.

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Chapter V lists the conclusions obtained from the study and presents the recommendations for an adequate use of the model.

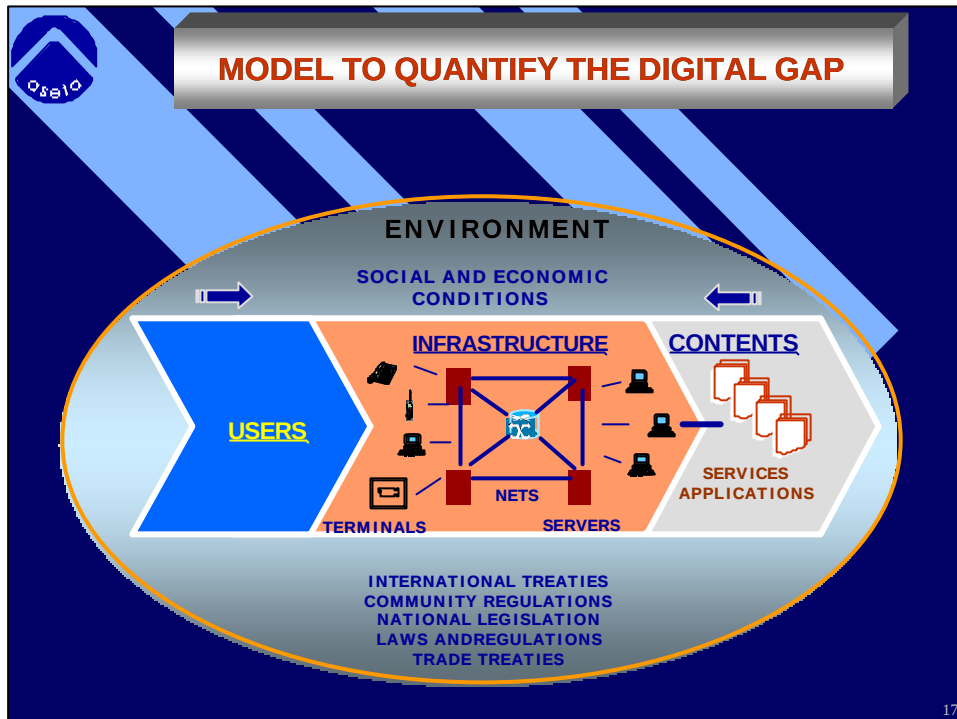
Finally, the attachments include the tables of the data used during the study with all the variables and the corresponding sources.

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RESULTS

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IN THE ENVIRONMENT OF THE INFORMATION SOCIETY, THE EVOLUTION OF ICT IS WIDENING THE DIFFERENCES BETWEEN THE INFORICH AND THE INFOPOOR.

SUCH DIFFERENCES ARE KNOWN AS:

"THE DIGITAL GAP"

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DEFINITION OF DIGITAL GAP

Digital Gap is the difference of conditions that exists between people, communities, provinces, countries, etc. that have optimum access to Communication and Information Technologies on a daily basis, and those who do not have access to them; or if they do, they do not know how to use them properly and take advantage of them.

The Digital Gap does not refer only to technological aspects; it is the result of some factors combined: social and economic situation, culture, politics and infrastructure of Telecommunications and Information Technology

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MATHEMATICAL MODEL

👉 **ANALYSIS OF MAIN COMPONENTS (ACP in Spanish)**

The ACP is a technique for the reduction of dimensions. It starts with a data matrix with the values of a set of variables on a determined number of individuals (countries), and then finds a representation for these individuals and variables in spaces of one, two or three dimensions, where the interpretation is simpler.

👉 **DIGITAL DEVELOPMENT LEVEL (NDD in Spanish)**

It refers to the development level of a country in a process of transition into becoming a society based on information and knowledge.

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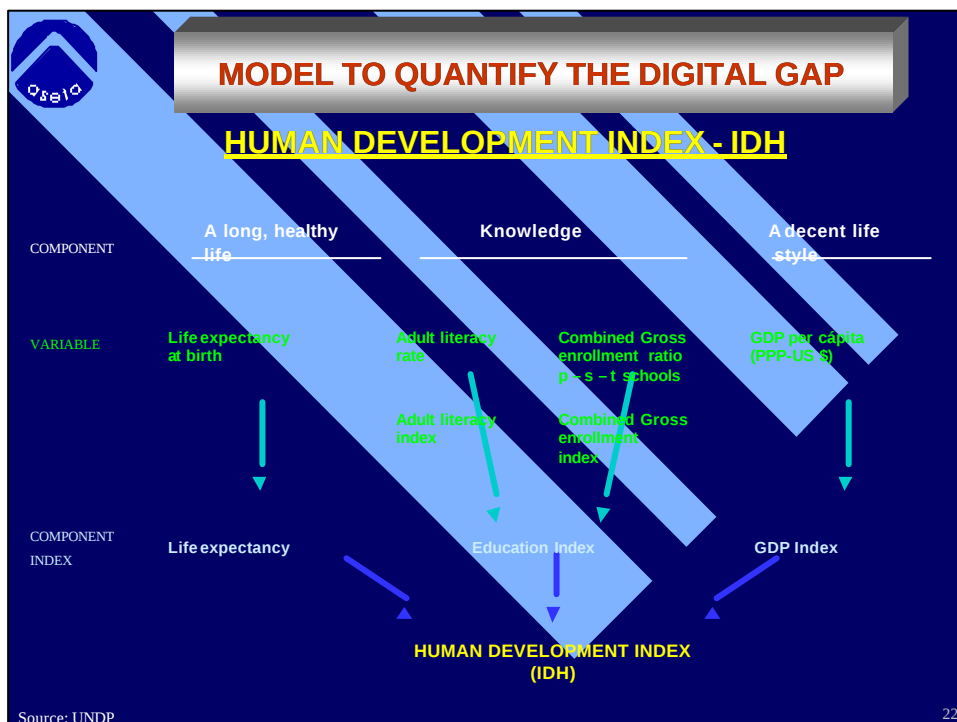


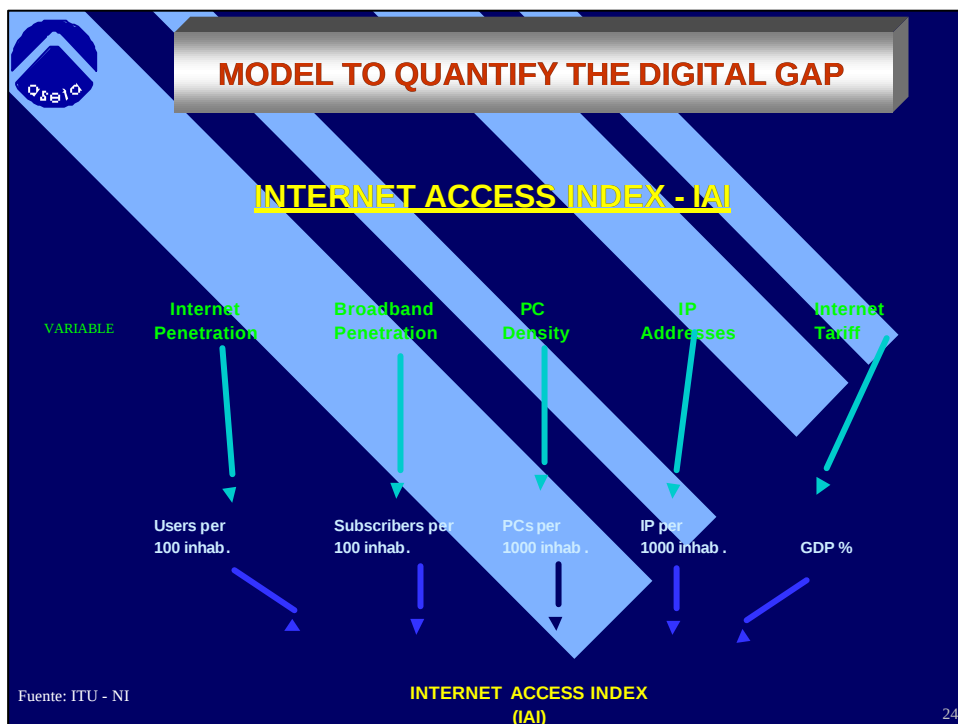
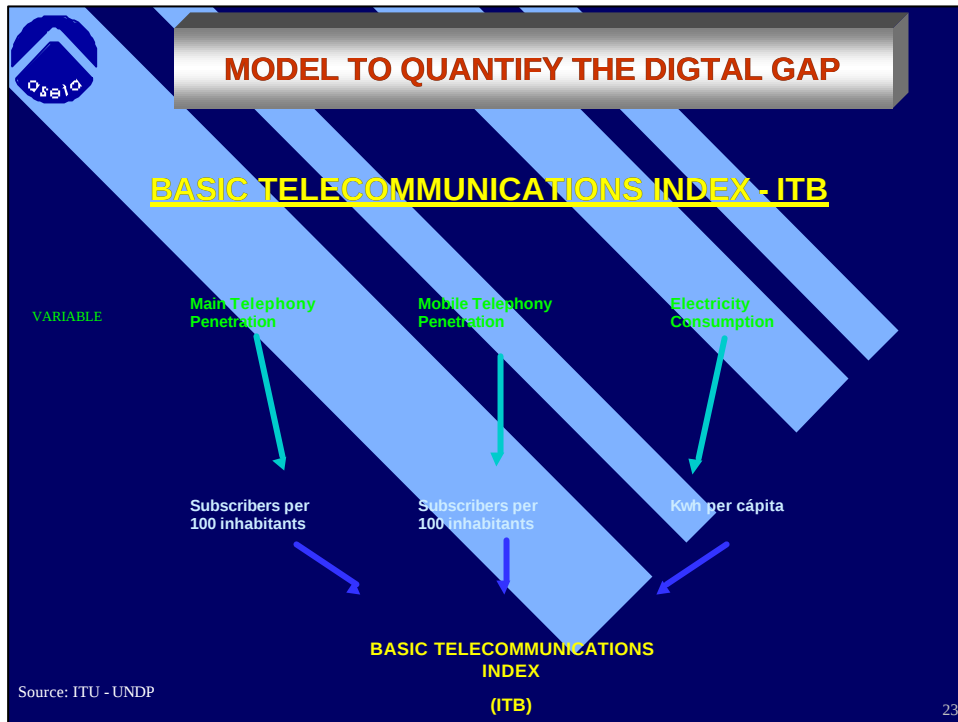
MODEL TO QUANTIFY THE DIGITAL GAP

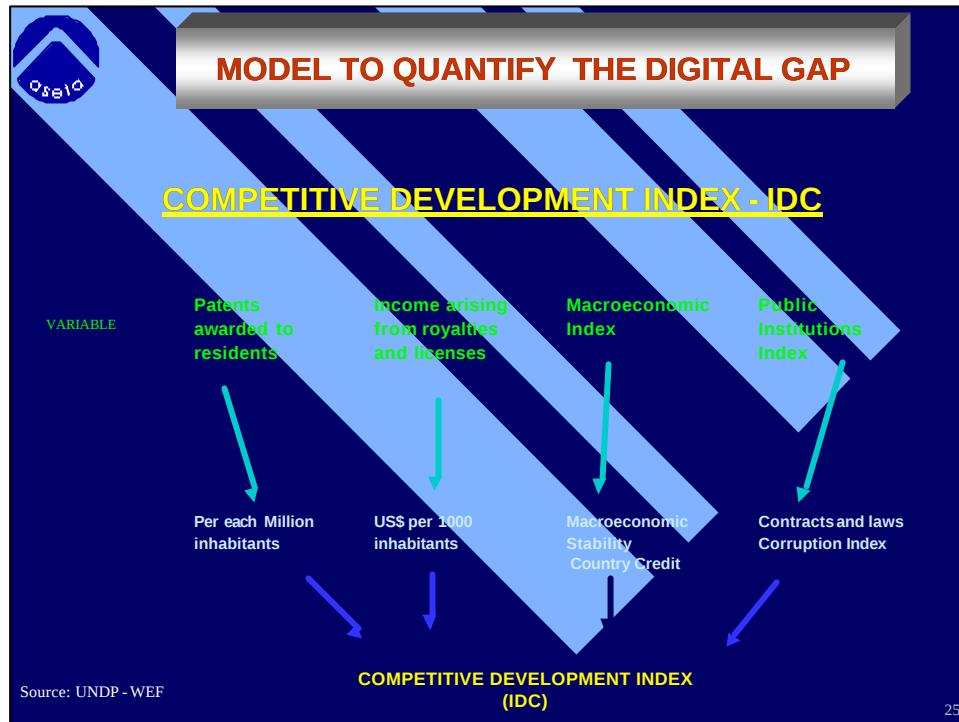
INDICATORS

- **HUMAN DEVELOPMENT INDEX - IDH** measures a country's general progress by using three basic dimensions of human development: longevity, knowledge and decent life style.
- **BASIC TELECOMMUNICATIONS INDEX - ITB** shows the development level of the universal service.
- **INTERNET ACCESS INDEX - IAI** shows Internet's level of mass use.
- **COMPETITIVE DEVELOPMENT INDEX – IDC** shows the environment in which a country's activities take place.

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MATHEMATICAL MODEL

$$NDD = a_1 * IDH + a_2 * ITB + a_3 * IAI + a_4 * IDC$$

a_1, a_2, a_3, a_4 : optimum weights for linear combination

Digital Gap

$$BD = 1 - NDD$$

$$BD = 1 - (0.271203 * IDH + 0.295470 * ITB + 0.294859 * IAI + 0.254955 * IDC)$$

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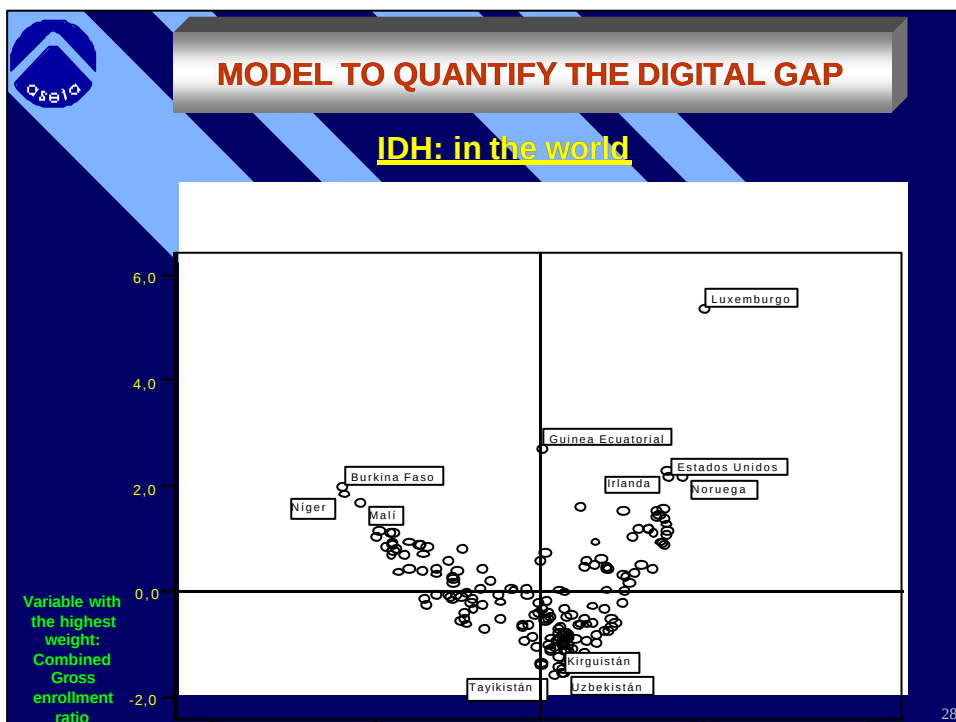
HOW TO CALCULATE INDEXES

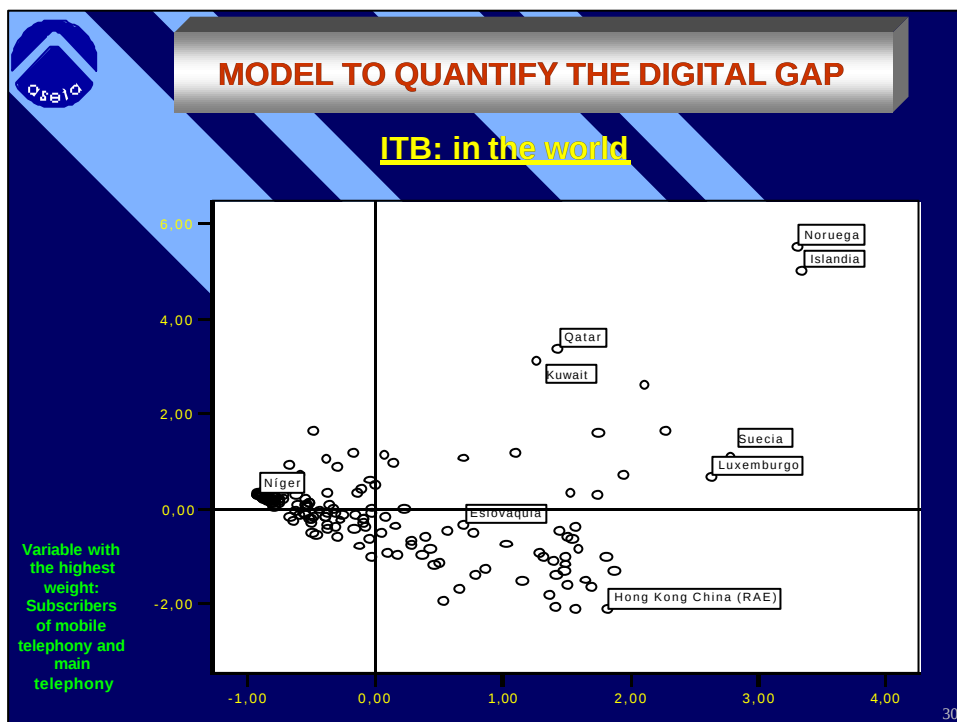
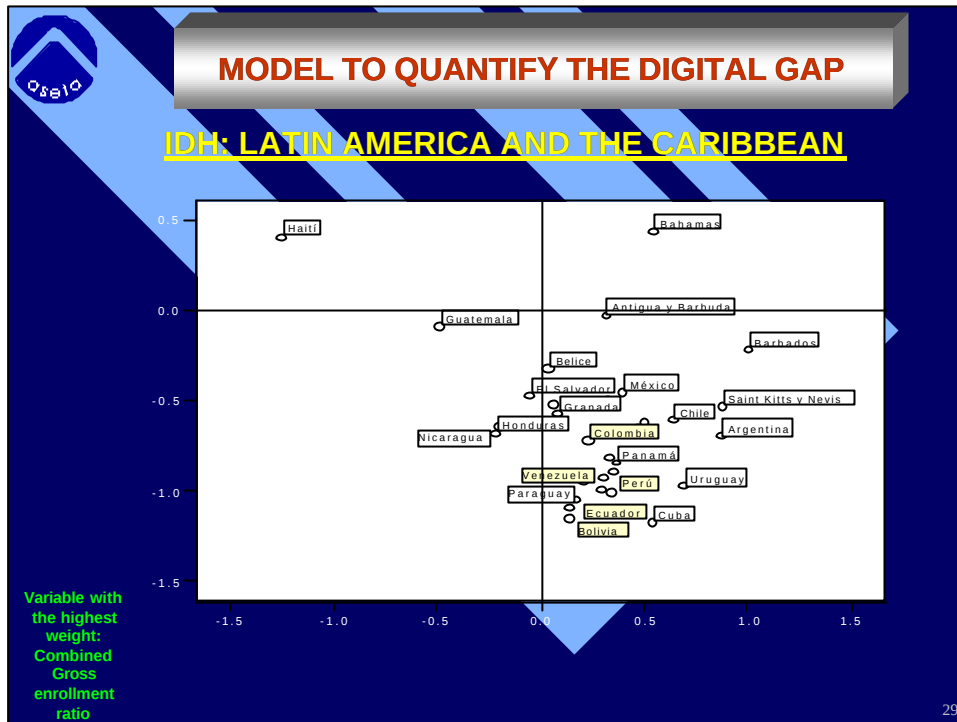
IDH - ITB - IAI - IDC

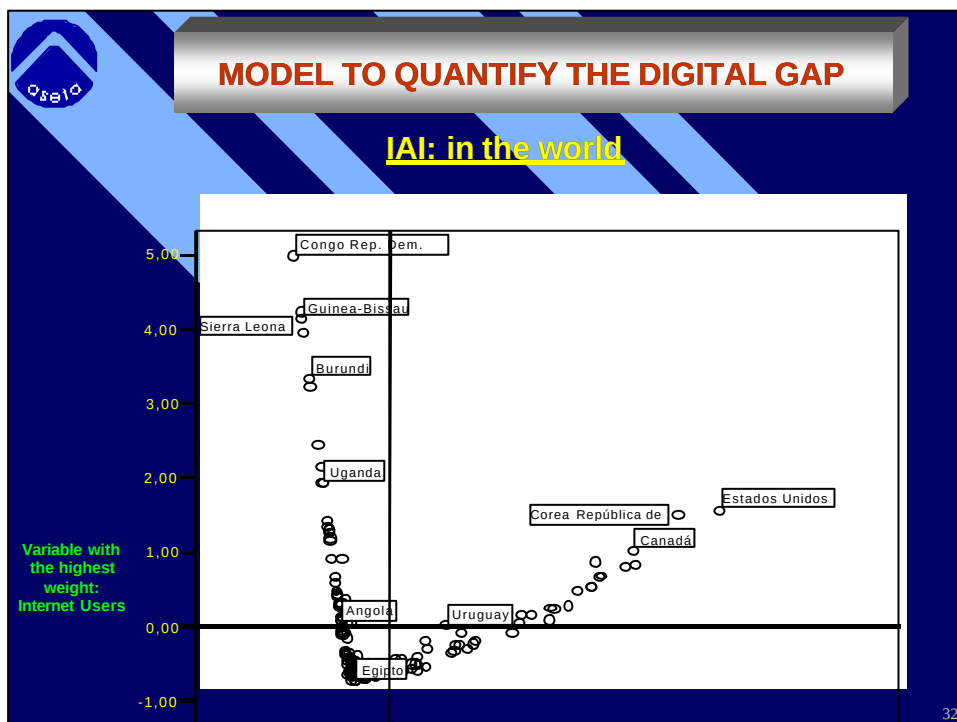
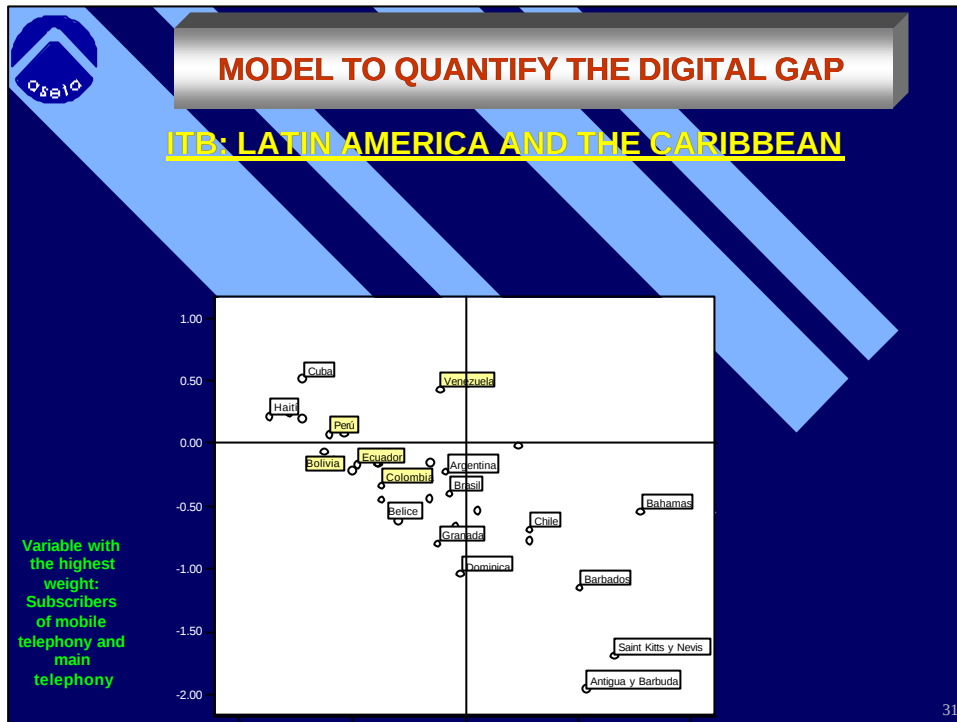
Taking into account the first main component of each index, we proceed to calculate the values of each index, within a range between 0 and 1.

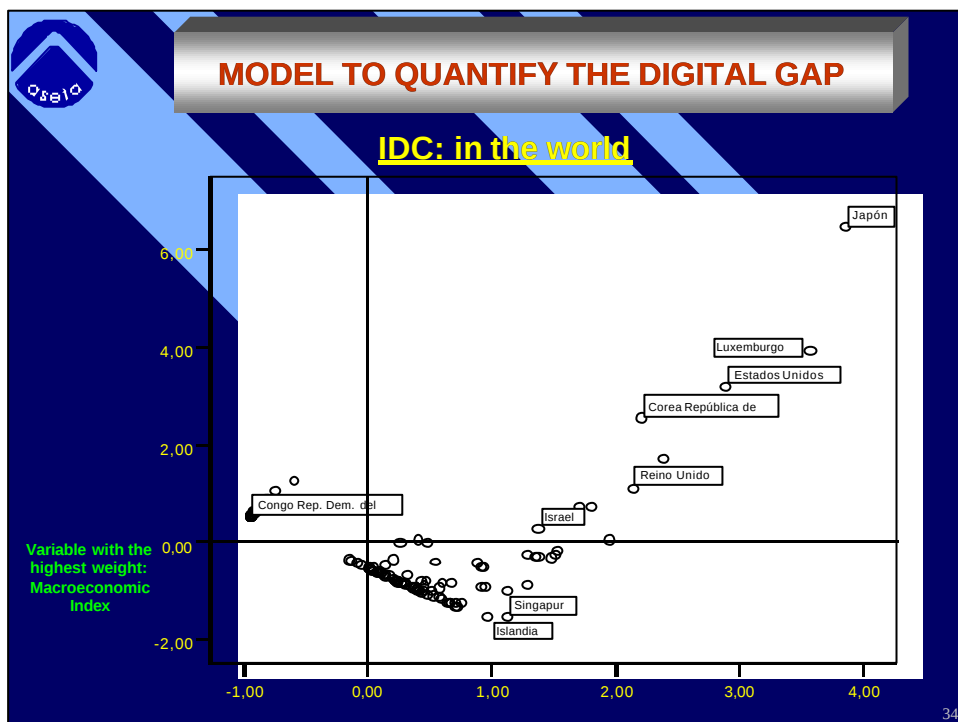
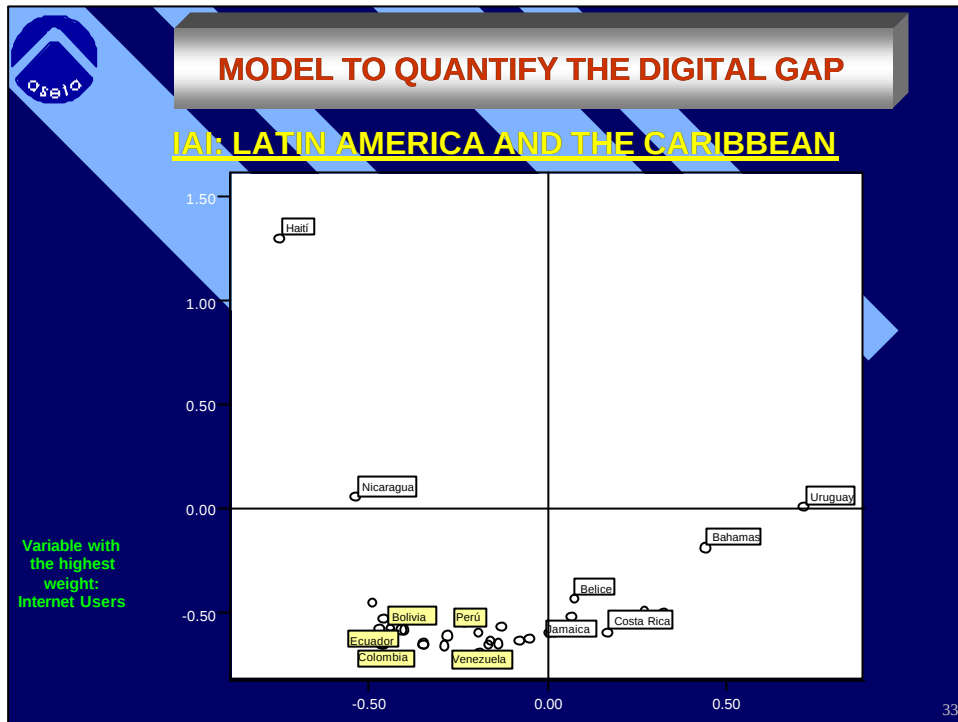
$$\text{Index} = \frac{\text{Value Observed} - \text{Minimum Value}}{\text{Maximum Value} - \text{Minimum Value}}$$

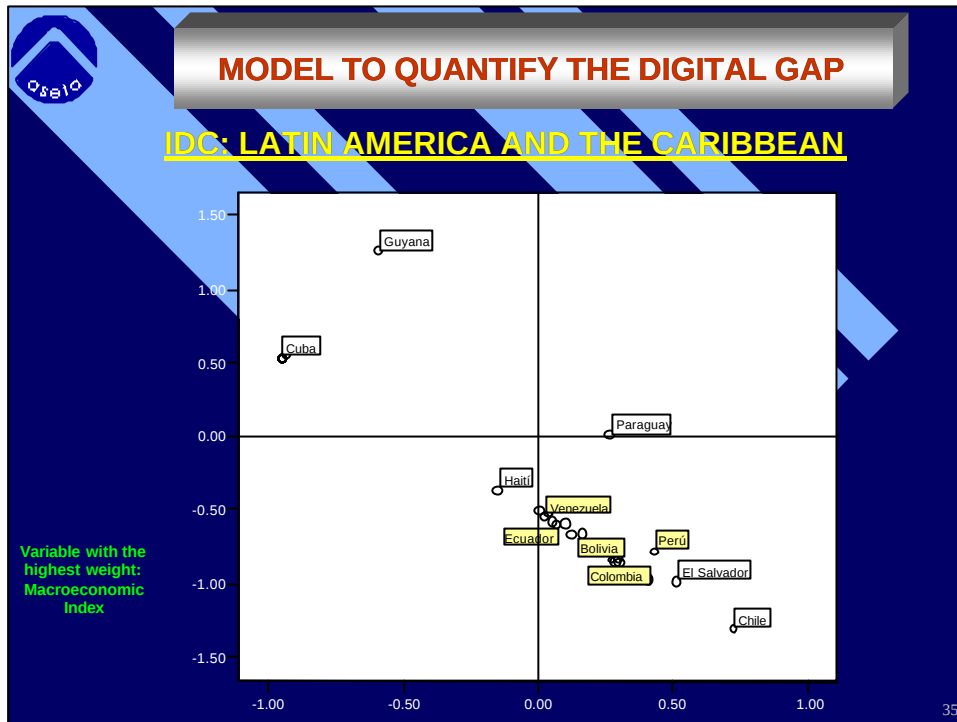
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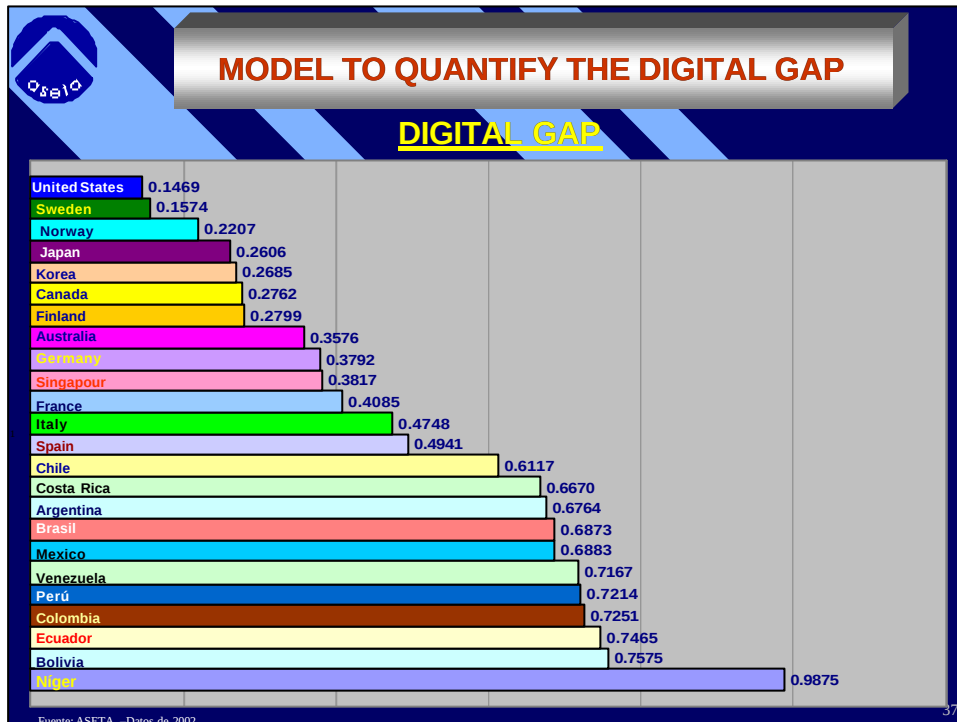




MODEL TO QUANTIFY THE DIGITAL GAP

Country	IDH	ITB	IAI	IDC	BD
United States	.8223	.5990	.9911	.7930	.1469
Sweden	.8134	.7735	.8011	.8114	.1574
Norway	.8487	.8826	.7016	.5015	.2207
Japan	.7814	.4934	.6075	.9923	.2606
Korea	.7338	.4842	.8964	.6511	.2685
Canada	.8123	.6343	.7950	.4751	.2762
Finland	.8059	.6665	.6690	.5975	.2799
Australia	.8193	.5569	.6026	.4623	.3576
Germany	.7798	.5041	.5376	.5699	.3792
Singapore	.7482	.5259	.6480	.4306	.3817
France	.7895	.5162	.4397	.5475	.4085
Italy	.7622	.5069	.3907	.3777	.4748
Spain	.7670	.4901	.3290	.3899	.4941
Chile	.6670	.2530	.2909	.3454	.6117
Costa Rica	.6449	.1603	.2720	.2713	.6670
Argentina	.7062	.1759	.2168	.2043	.6764
Brasil	.6394	.1786	.2066	.2575	.6873
Mexico	.6279	.1620	.2117	.2812	.6883
Venezuela	.6122	.1703	.1899	.2006	.7167
Peru	.6206	.0677	.1911	.2853	.7214
Colombia	.6005	.1159	.1784	.2580	.7251
Ecuador	.5911	.0940	.1697	.2165	.7465
Bolivia	.5856	.0632	.1623	.2216	.7575
Níger	.1729	.0015	.0617	.0000	.9875

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CONCLUSIONS

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CONCLUSIONS

- The model that has been developed can be used as a tool in the planning and follow-up activities related to the use and exploitation of communication and information technologies. It uses statistical programs which have a built-in Main Components Analysis – ACP technique. At the present moment there is a wide variety of this kind of programs; some are free to be used and others require a license purchase.

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CONCLUSIONS

- As the world community incorporates new criteria to evaluate the progress made in contents development, services, applications and in their level of usage, all of which are supported in the communication and information technologies, new variables might be introduced. These variables will enhance the model scope in accordance with the evolution of the Information Society.

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