

## **IBIS: International Benchmarking of the Information Society**

**Bartolomeo Sapio**, Fondazione Ugo Bordoni, Italia

**Isabella Maria Palombini**, Ministero delle Comunicazioni, Italia

**Sabrina Cioffi**, Ministero delle Comunicazioni, Italia

### **Abstract**

This paper describes IBIS (International Benchmarking of the Information Society), a new simulation system implemented by appointment of the Italian Ministry of Communications, with the aim of defining and implementing an instrument to monitor the ICT (Information and Communication Technology) world in the main European countries, in accordance to the needs of implementation and benchmarking outlined in the e-Europe plan. The system has been designed and operationalized with a flexible and modular architecture, allowing the insertion or substitution of new monitoring objectives at any time. The algorithms to simulate alternate scenarios are flexible and easily customizable, in order to allow easy access to decision makers.

### **1. Introduction**

The paper describes IBIS (International Benchmarking of the Information Society), a new simulation system implemented by Fondazione Ugo Bordoni (FUB) by appointment of the Italian Ministry of Communications, with the aim of defining and implementing an instrument to monitor the ICT (Information and Communication Technology) world in the main European countries, in accordance to the needs of implementation and benchmarking outlined in the e-Europe plan.

Definitions of benchmarking and its importance for decision-making have been extensively discussed (Alan 1993; Bogan & English 1994; Bramley 1996; Gohlke 1997; Keelhey et al. 1996; Sauer & Petrie 1996; St. Clair 1993). Other benchmarking initiatives in Europe can be found online from several sources<sup>1</sup>.

By selecting, structuring and displaying a set of indicators, IBIS allows the monitoring of the processes in the sector, also in relation to specific objectives, in order to support decisional processes and communication among all interested players, with particular focus on institutional players.

By offering a systematic and analytic vision of data, collected only from reliable sources, IBIS aims to deal with the fragmentations and contradictions of different rankings and relevations in the sector, at the same

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<sup>1</sup> <http://www.sibis-eu.org>  
<http://www.biser-eu.com>  
<http://www.b2b-metrics.de>  
<http://www.istat.it/diecofis>  
<http://www.ecatt.com>  
<http://nesis.jrc.it>  
<http://www.researchineurope.org/newkind/index.htm>

time maintaining high flexibility and modularity in relation to both the objectives of interpretation and the levels of the analysis.

The system has been designed and realized with a flexible and modular architecture, allowing the insertion or substitution of new monitoring objectives at any time. The algorithms to simulate alternate scenarios are flexible and easily customizable, in order to allow easy access to decision makers.

Each objective is monitored both at a global level at the level of single sectors (fixed, mobile and broadcast). IBIS benchmarks Information and Communication Technologies in five European countries: France, Germany, Italy, Spain and United Kingdom.

The monitored elements are: single indicators; areas and sub-areas, as aggregation of indicators belonging to a homogeneous monitoring cluster; economic sectors; objectives defined in the e-Europe 2005 plan; interesting objectives.

## **2. How does IBIS work?**

IBIS benchmarks Information and Communication Technologies between Italy and four European countries: France, Germany, Spain and United Kingdom.

The results are visualized with a colored symbol next to every monitored element: this symbol will be referred to as "light".

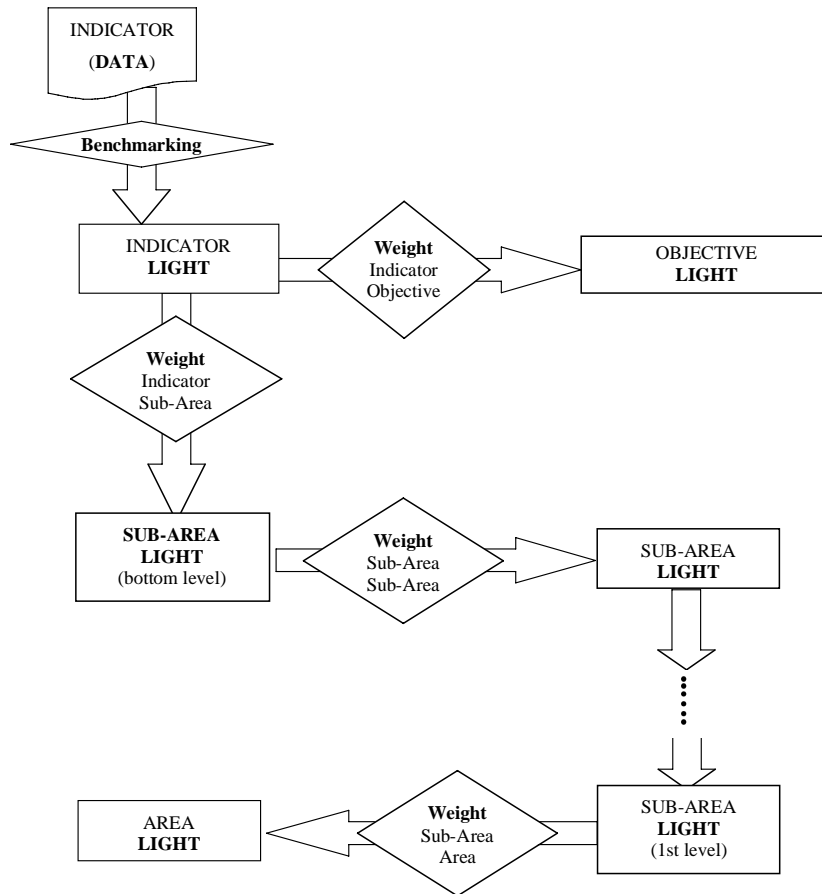
The monitored elements are:

- single indicators (e.g.: dimension of fixed networks equipment market / GDP);
- areas and sub-areas, as aggregation of indicators belonging to a homogeneous
- monitoring cluster (e.g.: dimension of the infrastructure offer market)
- economic sectors (fixed, mobile e audiovisual);
- interesting objectives; these are pre-defined objectives (e.g.: broadband
- development), evaluated through associated indicators.

The color of the light, representing the situation of the considered element, is calculated by the system by specific algorithms (Figure 1).

Lights are calculated only where data are available.

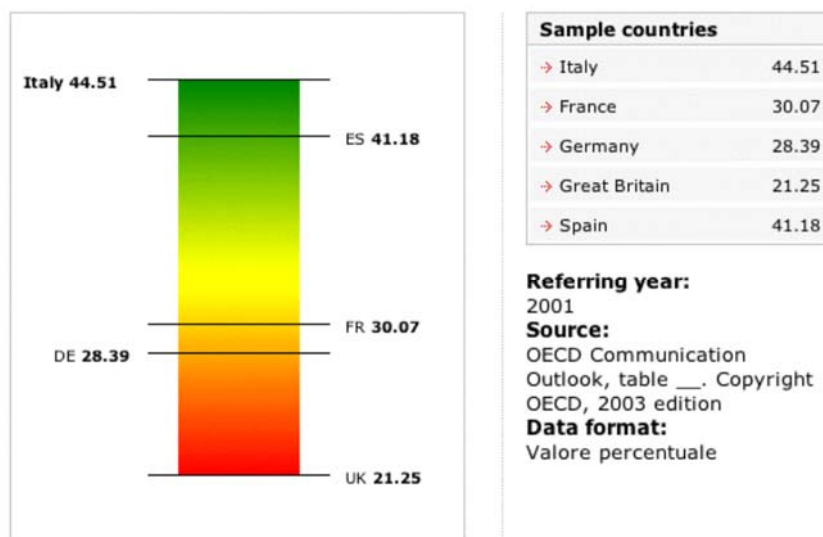
Figure 1. Light calculation diagram.



**2.1 Algorithm to calculate lights for indicators**

The algorithm to calculate lights for indicators takes into account the position of the indicator referred to Italy in a linear scale (Figure 2).

Figure 2. Indicator: Mobile telecommunications services revenues.



The extremes are represented by the minimum and maximum values of the indicator in the considered countries or, in alternative, by one or two values defined as a reference.

The color of the indicator light for Italy varies on a chromatic scale from red to green, according to the indicator position between the two extremes.

## 2.2. Role and definition of weights

Each indicator is associated to:

- a weight related to each objective the indicator is associated with, *in order to calculate the objective light*
- a weight related to the sub-area it belongs to, relative to the indicator specific sector, *in order to calculate the sub-area light, relative to the specific sector*
- a weight related to the sub-area it belongs to, relative to the global sector, *in order to calculate the sub-area light, relative to the general sector*

Each sub-area is associated to:

- a weight related to the area / higher level sub-area, *in order to calculate the area / higher lever sub-area light*

### **2.3 Algorithm to calculate lights for areas and sub-areas**

Lights for areas and sub-areas are calculated with respect to both single sectors of each indicator (fixed, mobile, audiovisual) and the general ICT sector, defined as "Global Communications Market"

Below the area level there are four sub-area levels.

The lowest sub-area (level four) directly groups homogenous indicators and its light is calculated as an average of the colors of these indicator's lights (each color is associated to a number for this purpose), also taking into account the weight assigned to each indicator, for this calculation, with respect to the sub-area.

At the present state, all indicators have the same weight with respect to sub-areas.

The color of the lights for areas or higher level sub-areas are determined by the average of colors of sub-areas at the immediately lower level, also taking into account the weight assigned to each sub-area, for this calculation, with respect to the area / higher level sub-area.

At the present state, all sub-areas have the same weight with respect to higher level areas.

### **2.4 Algorithm to calculate lights for objectives and sub-objectives**

The color of the light for each objective is calculated as an average of the colors of the lights of all indicators assigned to the objective (each color is associated to a number for this purpose), also taking into account the weight assigned to each indicator, for this calculation, with respect to the objective.

At the present state, all indicators have the same weight with respect to objectives.

A similar procedure is adopted for sub-objectives.

## **3. System Blocks**

IBIS allows three different navigations: by objectives, by areas and by sectors. In order to start each navigation, buttons are provided, positioned at the head of the Home Page and of the main pages.

### **3.1. Objectives**

IBIS monitors the objectives defined in the e-Europe 2005 plan: *Secure information infrastructure; Modern online public services; Internet; Dynamic e-business environment; Broadband.*

In order to provide a more complete scenario of the ICT world, a further objective has been defined: *Dynamic traditional communications.* It includes also elements that are already in a mature phase in the communications world (like GSM mobile telephony or satellite television), but still play (and will play in the future) an important role.

Besides, the system has been designed and realized with a flexible and modular architecture, allowing the insertion or substitution of new monitoring objectives at any time.

Each objective is monitored both at a global level at the level of single sectors (fixed, mobile and broadcast).

Objectives monitoring is performed through a direct link to indicators.

The arithmetic average of colors related to indicators associated to the objective determines the color of the objective itself.

### ***3.2. Areas***

One of the main aims of IBIS is structuring the selected set of indicators according to areas and sub-areas of the considered market.

This structure allows performing market analysis and objectives monitoring referring to single specific contexts. Each area also represents the overall situation referred to all its sub-areas.

The arithmetic average of colors related to sub-areas belonging to the area at an immediate upper level determines the area color.

Examples of areas and sub-areas are: offer and demand, services and infrastructures, ownership of devices of business and consumer users, etc..

A few sub-areas have been segmented also to take into consideration specific issues, such as the dimension of firms, the income level of families, or the types of Public Administrations. Yet, only aggregate data were considered in the measures, since data are not homogeneously available.

### ***3.3. Sectors***

IBIS allows the monitoring of the ICT world also in relation to the main economic sectors in it. Thus a further dimension of analysis is provided, in order to have a broader (but also more specific) vision of the factors determining its evolution.

The three considered sectors are: mobile; fixed/networking; audiovisual.

Beside, a general sector has been considered, representing the entire ICT world, in order to include those indicators not fitting in the other sectors.

The arithmetic average of colors related to indicators belonging to the considered sector (thus excluding the general sector) gives the color of the sector itself.

#### 4. IBIS and Decision-Making

IBIS allows the simulation of different scenarios. Users can experiment with different weights and algorithms in order to identify critical paths on the road to reach monitored objectives.

Benchmarking through IBIS can be the basis for significant decision-making and a way to quickly identify improvement opportunities, allowing the public decision maker to take more insightful and accurate conclusions and recommendations.

IBIS is a tool to focus efforts by identifying the process to be benchmarked; establishing commitment to the benchmarking process; defining and understanding the process to be benchmarked; choosing metrics and collecting data; choosing benchmarking partners and collecting data from them; analyzing partners' data and comparing that data against process data; implementing improvements and monitoring results.

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### **Appendix: Description of monitoring objectives**

#### **1. *Secure information infrastructure***

In the present development phase, it is important to verify to what extent security (of transactions, of information, of payments), both perceived and real, is a stimulating or limiting factor for the diffusion of ICT in a modern information society.

#### **2. *Modern online public services***

A crucial dimension is represented by ICT applications to the public system. Its evolution requires monitoring due to its enabling effects on the entire system. Public services considered here are not necessarily provided by public administrations (see the e-learning case).

#### **3. *Internet***

In relation with Internet development, the objective is obviously strategic, in order to monitor communication and digital interaction applications realized by private and public actors.

#### **4. *Dynamic e-business environment***

The diffusion of a modern system of electronic transactions gives efficiency and competitiveness to a country. It is important to verify the development of e-business offer and the propension of the demand to use these systems. Among objectives the development of the Internet is separated from the development of e-business.

#### **5. *Broadband***

Broadband is the main infrastructural instrument to promote, on a large scale, modern ICT solutions and services.



***6. Dynamic traditional communications***

The objectives included in the e-Europe plan refer to the future, but do not consider segments in the communications system that will have a crucial role in the present and future evolution. This ought to be monitored in terms of policy.

Thus the objective "Dynamic traditional communications" has been added, considering also the activities belonging to the communications system yet not directly related to e-business, broadband, public services and security: typical examples are the diffusion of GSM mobile telephony and satellite television.