Benchmarking Internet

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INTRODUCTION

Benchmarking is often defined as a total quality management (TQM) tool (Gohlke, 1998). It is also one of the most recent words introduced into the lexicon of modern management (Keegan, 1998). Only since the mid-1980s have explicit benchmarking activities emerged.

With expanded benchmarking practices, a variety of professional associations have been established: the Benchmarking Exchange, Corporate Benchmarking Services, Information Systems Management Benchmarking Consortium, Telecommunications International Benchmarking Group, and International Government Benchmarking Association, to name a few. Similarly, there exist an increasing number of professional Web sites, among them the Benchmarking Exchange, Benchmarking in Europe, Public Sector Benchmarking Service, Best Practices, the Benchmarking Network, and Benchmarking. (Uniform resource locators for these organizations and Web sites are found in the Further Reading section.) A study being conducted among the members of the Benchmarking Exchange showed that the main search engine used among practitioners is Google.com, which includes almost 1 million benchmarking-related documents (Global Benchmarking Newsbrief, 2002).

The expansion also can be observed in numerous textbooks dealing either with the general notion of benchmarking or with specific benchmarking areas. Certain textbooks have already been recognized as classics (e.g., Camp, 1989). As far as periodicals are concerned, numerous professional and community newsletters arose from practical business activities, such as *eBenchmarking Newsletters* by the Benchmarking Network (n.d.), *Benchmarking News* by the European Association of Development Agencies (n.d.), and *ICOBC & Free Newsletter* by the International Council of Benchmarking Coordinators (n.d.). Benchmarking has also become a scientific issue within the field of quality management and specialized scholarly journals appeared (e.g., *Benchmarking—an International Journal and Process Management in Benchmarking*). The online academic databases searches such as *EBSCOHost—Academic Search Premier, Emerald* and *ABI/INFORM Global, Social Science Plus* show that in 2002 each of these databases already contained a minimum of 338 and a maximum of 939 papers related to benchmarking. The number of papers that relate simultaneously to benchmarking and to the Internet is considerably lower: from 3 in *Emerald* to 33 in the *EBSCOHost* database. Papers on benchmarking can be found mostly in *Internet Research*, *Quality Progress*, *Computerworld* and *PC Magazine*. When Longbottom (2000) reviewed approximately 500 benchmarking-related papers published between 1995 and 2000 and referenced on online academic indices (*ANBAR and Emerald*) as well as on various Internet sites, he found that the majority (80%) could be described as practical papers discussing specific aspects of benchmarking. The remaining academic papers are a mix of theory and development.

In the Web of Science, the leading science citation database, almost 2,000 benchmarking-related papers were found in 2002. Papers in this database most often refer to the issues of improving competitive advantage or to specific areas such as health care and education. Robert C. Camp, often recognized as the founder of the benchmarking concept, was the most frequently cited author in this database, with almost 700 citations. In 2002, there were almost 200 books about benchmarking available at the *Amazon.com* Web site.

Nevertheless, benchmarking predominantly relates to the business environment, although over the past few years we can observe also an increased usage in more general context. Sometimes the notion of benchmarking even appears as a synonym for any comparison based on quantitative indicators. As an example, in some studies even the simplest comparisons based on standardized statistical indicators have been labeled "benchmarking" (i.e., Courcelle & De Vil, 2001; Petrin, Sicherl, Kukar, Mesl, & Vitez,

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2000). The notion of benchmarking thus has a wide range of meanings, from a specific and well-defined business practice to almost any comparison based on empirical measures. In this chapter, we use the notion of benchmarking in a broad context, although we concentrate on a specific application: the Internet. We must recognize that the Internet is a newer phenomenon than benchmarking, at least in the sense of general usage. We are thus discussing a relatively new tool (benchmarking) in a very new area (Internet). From the aspect of the scholarly investigation, the problem cannot be precisely defined. In particular, Internet-related topics can be extremely broad, as the Internet has complex consequences on a variety of subjects, from business units to specific social segments, activities, and networks, including the everyday life of the average citizen. Additional complexity arises because the Internet is automatically associated with an array of closely related issues (i.e., the new economy, new society, new business processes, new technologies) that are not clearly separated from the Internet itself. In certain areas, the Internet may have a rich and specific meaning that radically extends beyond its mere technical essence as a network of computers based on a common communication protocol.

In this chapter, we therefore understand benchmarking in its broadest sense but limit the scope of study, as much as possible, to its relation to the Internet and not to related technologies and the corresponding social and business ramifications. In particular, we limit this discussion to business entities and national comparisons.

In the following sections, we describe the notion of benchmarking in a business environment and also in a more general context, such as sectoral benchmarking and benchmarking of framework conditions. Next, we concentrate on benchmarking of Internet-related issues, particularly with regard to the performance of various countries. Key methodological problems are also discussed with specific attention to the dimension of time.

BUSINESS BENCHMARKING

A relatively sharp distinction exists between benchmarking at the company level and other types of benchmarking, which we consider extensions of the technique and discuss later in the chapter. First, we examine additional details related to the business benchmarking process.

The Concept of Benchmarking

The common denominator of various definitions of benchmarking is the concept of a "proactive, continuous process, which uses external comparisons to promote incremental improvements in products, processes, and services, which ultimately lead to competitive advantage through improved customer satisfaction, and achieving superior performance" (Camp, 1989, p. 3). The majority of authors also distinguish between *benchmarking* and *benchmarks*. The latter are measurements that gauge the performance of a function, operation, or business relative to others (i.e., Bogan & English, 1994, pp. 4–5). Similarly, Camp (1989) defined benchmark as a level of service provided, a process or a product attribute that sets the standard of excellence, which is often described as a "best-in-class" achievement. Benchmarking, in contrast to benchmarks, is the ongoing search for best practices that produce superior performance when adapted and implemented in an organization (Bogan & English, 1994). The *benchmarking process* is thus a systematic and continuous approach that involves identifying a benchmark, comparing against it, and identifying practices and procedures that will enable an organization to become the new best in class (Camp, 1989; Spendolini, 1992).

In general, two types of benchmarking definitions can be found. Some definitions are limited only to the measuring and comparing while the others focus also on implementation of change and the monitoring of results. Within this context Camp (1989, pp. 10–13) distinguished between *formal* and *working* definitions, with the latter emphasizing the decision-making component and the former relating to the measurement process alone.

As already noted, benchmarking is basically a TQM tool (Codling, 1996; Czarnecki, 1999; Gohlke, 1998). If quality management is the medicine for strengthening organizations, benchmarking is the diagnosis (Keegan, 1998, pp. 1–3). Although benchmarking readily integrates with strategic initiatives such as continuous improvement and TQM, it is also a discrete process that delivers value to the organization itself (American Productivity and Quality Center [APQC], 2002). At the extreme side, Codling (1996, pp. 24–27) did not classify benchmarking within the TQM framework at all but indicated that they are two separate processes that do not exist within a simple hierarchical relationship but are equal concepts with considerable overlap. We add that apart from TQM, benchmarking also integrates with reengineering (Bogan & English, 1994) and the Six Sigma approach (Adams Associates, 2002).

In the late 1970s, Xerox developed a well-known benchmarking project, considered a pioneer in the process (Rao et al., 1996). Xerox defined benchmarking as "a continuous process of measuring products, services, and practices against the toughest competitors or those companies recognized as industry leaders" (Camp, 1989, p. 10). Codling (1996) noted, however, that in the 1950s, well before the Xerox project, to U.K. organizations, Profit Impact of Marketing Strategy (PIMS) and the Center for Interfirm Comparison (CIFC) conducted activities that could be defined as benchmarking. PIMS and CIFC systematically gathered information on companies' performance and compared these data with those from similar businesses. Early seeds of benchmarking can be also found in the Japanese automotive industry when Toyota systematically studied U.S. manufacturing processes at General Motors, Chrysler, and Ford in the 1950s. Toyota then adopted, adapted, and improved upon their findings. All these examples confirm that companies actually used benchmarking well before 1970s, most often using the methods of site visits, reverse engineering, and competitive analysis (Rao et al., 1996).

The emphasis on formal benchmarking processes changed markedly only in 1990s, not only in the business sector, but also in regional and public sectors, particularly in Australia, New Zealand, and the United Kingdom. The initial understanding of benchmarking was rapidly extended in numerous directions. Modern benchmarking thus refers to complex procedures of evaluation, comprehension, estimation, measurement and comparison. It

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covers designing, processing, and interpreting of the information needed for a improved decision making. This relates not only to businesses but also to the performance of other entities, including countries. As a typical example, in the second benchmarking report comparing the performance of Belgium with other countries, Courcelle and De Vil (2001, p. 1) defined benchmarking as a continuous, systematic process for comparing performances against the best performers in the world.

Company Benchmarking

As noted earlier, benchmarking is usually a part of the quality management concept directed toward making products or services "quicker, better and cheaper" (Keegan, 1998, p. 12). The APQC (2002) suggested using benchmarking to improve profits and effectiveness, accelerate and manage change, set stretch goals, achieve breakthroughs and innovations, create a sense of urgency, overcome complacency or arrogance, see "outside the box," understand world-class performance and make better informed decisions. Within the business environment, benchmarking is most often performed in the fields of customer satisfaction, information systems, employee training, process improvement, employee recruiting, and human resources.

The literature describes many types of benchmarking processes. Camp (1995, p. 16) distinguished between four types of benchmarking: internal, competitive, functional, and generic. Similarly, Codling (1996, pp. 8–13) differentiated three types or perspectives on benchmarking: internal, external, and best practice. Bogan and English (1994, pp. 7–9) also presented three distinct types of benchmarking: process, performance, and strategic benchmarking (see also Keegan, 1998, pp. 13–16).

Benchmarking procedures are usually formalized in 4 to 12 stages (APQC, 2002; Bogan & English, 1994; Camp, 1995; Codling, 1996; Longbottom, 2000; Keegan, 1998; Spendolini, 1992). As Bogan and English (1994, p. 81) stated, the differences among benchmarking processes are often cosmetic. Most companies employ a common approach that helps them plan the project, collect and analyze data, develop insights, and implement improvement actions. Each company breaks this process into a different number of steps, however, depending on how much detail it wishes to describe at each step of the template. This does not mean that some companies exclude some steps, but in practice certain steps may naturally combine into one (Codling, 1996, p. xii). The four major stages that appear to be common to all classifications are as follows:

1. *Planning*. This step involves selection of the broad subject area to be benchmarked, defining the process, and other aspects of preparation. During the planning stage, organizations perform an internal investigation, identify potential competitors against which benchmarking may be performed, identify key performance variables, and select the most likely sources of data and the most appropriate method of data collection.
2. *Analysis*. This step involves collection of data (e.g., from public databases, professional associations, surveys and questionnaires, telephone interviews, benchmarking groups), determination of the gap between the organization's performance and that of the benchmarks, exchange of information, site visits to the benchmarked company, and observations and comparisons of process. A structured questionnaire asking for specific benchmarks, addressed to the similar or competitive business entities, is often a crucial step in collecting the data.
3. *Action*. This step involves communication throughout the organization of benchmarking results, adjustment of goals, adaptation of processes, and implementation of plans for improvement.
4. *Review*. This step involves review and repetition of the process with the goal of continuous improvement.

Another classification of the benchmarking process relates to the maturity of the company. In the early phase of the process, a company applies *diagnostic benchmarking*. The second phase is *holistic benchmarking,* in which the business as a whole is examined, identifying key areas for improvement. In the third, mature phase, the company graduates to *process benchmarking,* focusing on specific processes and chasing world-class performance (Keegan, 1998; O'Reagain & Keegan, 2000).

From these descriptions, it is clear that benchmarking activities are performed in a dialogue with competitors. As Czarnecki (1999, pp. 158, 254) pointed out, however, such a relationship does not happen overnight. Traditional barriers among competing companies must come down, and cooperation must be clearly demonstrated. Today's companies realize that to get information, they also have to give information.

Of course, for a successful implementation of change, it is important to build on the managerial foundation and culture rather than blindly adopting another organization's specific process. Edwards Deming, sometimes referred to as the father of the Japanese postwar industrial revival, illustrated this in his well-known saying that "to copy is too risky, because you don't understand why you are doing it. To *adapt* and not *adopt* is the way" (Keegan, 1998). Bogan and English (1994) pointed out that one company's effective benchmarking process design may fail at another organization with different operating concerns.

EXTENSIONS OF BENCHMARKING

Many authors (Keegan, 1998; O'Reagain & Keegan, 2000) strictly distinguish between benchmarking at the organizational (company, enterprise) level, benchmarking at the sector level, and, more generally, benchmarking of framework conditions. These extensions of benchmarking are the main focus in this section.

(Public) Sector Benchmarking

Public sector benchmarking is a natural extension of company benchmarking. Similar principles can be applied to the set of enterprises that make up an industry. Sector benchmarking thus focuses on the factors of competitiveness, which are specific to a particular industry

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(O'Reagain & Keegan, 2000). The usual aim here is to monitor the key factors that determine the ability of the sector to respond to continually changing international competitiveness.

During the past few decades, the notion of benchmarking extended also to a variety of nonindustrial fields, particularly to the public sector and especially to the social and welfare agencies in the health and education sector (Codling, 1996, p. 6). Of course, the goals of a public sector organization differ from those of a commercial company (O'Reagain & Keegan, 2000). For public sector organizations, benchmarking can serve as the surrogate for the competitive pressures of the market place by driving continuous improvement in value for money for taxpayers. Benchmarking can help public sector bodies to share best practices systematically with the private sector and with public bodies (e.g., government), as well as with other countries (Cabinet Office, 1999; Keegan, 1998, pp. 126–128).

A typical example of this type of benchmarking is the intra-European Union (EU) and EU—U.S. study on the performance of the national statistical offices. The comparisons of explicit benchmarks related to consideration of the time lag between data collection and the release of the economic statistics, which showed considerable lag within the EU statistical system (Statistics Sweden and Eurostat, 2001, p. 12). The study also showed, however, that in the EU international harmonization of economic statistics has been an important priority over the last decade. Further harmonization on a global level (guided by the United Nations, International Monetary Fund, and Organization for Economic Co-operation and Development [OECD]) is regarded as a much more important part of the statistical work in Europe compared with the United States, where complying with international standards has been of less importance.

Recognition that award models derived for commercial organizations can be equally applied to public sector organizations has also increased in recent years. To provide a consistent approach to assessment, some authors suggest the use of the European Foundation for Quality Management (EFQM) model for business excellence (e.g., Cabinet Office, 1999; Keegan, 1998, pp. 45–47). Keegan (1998, pp. 126–130) also mentioned "Hybrid Benchmarking," a technique that compares performance against others in both private and public sectors. Here the sources of information are similar work areas within the organization of the public sector (government departments and other public bodies) and the private sector.

Framework Conditions Benchmarking

The benchmarking method traditionally has been applied at the organizational and sector levels to evaluate the performance of the management processes, but it has been extended to the identification and the evaluation of key factors and structural conditions affecting the entire business environment. This extension is usually called the framework conditions benchmarking (Courcelle & De Vil, 2001, p. 2).

Benchmarking of framework conditions typically applies to those key elements that affect the attractiveness of a region as a place to do business. These elements can be benchmarked on a national or regional level: macroeconomic environment, taxation, labor market, education, transportation, energy, environment, research and development, foreign trade, and direct investment, as well as information and communication technology (ICT) (Courcelle & De Vil, 2001; Keegan, 1998, pp. 20–21).

Benchmarking of framework conditions therefore usually involves regions or states comparing the regulations, processes and policies that affect the business environment. Benchmarking of framework conditions usually provides an instrument for evaluating the efficiency of public policies and for identifying steps to improve them by reference to worldwide best practice (European Conference of Ministers of Transport, 2000, p. 12).

The philosophy and practice of benchmarking are roughly similar in different domains of application. However, there is an important difference in the feasibility of using results in the case of the framework conditions benchmarking, because the political power to implement changes is often lacking. Therefore one of the most important elements of the benchmarking best practice may be missing.

Benchmarking on the (Inter)national Level

In recent years, the notion of benchmarking has become extremely popular in the evaluation and comparison of countries. Theoretically, this type of benchmarking arises from benchmarking framework conditions; however, two specifics are worth noting.

Standardized comparative indicators have existed for centuries, yet the explicit label of benchmarking strongly emerged for these comparisons only with the rise of the Internet and with recent comparisons of ICT developments. Often, such notion of benchmarking for country comparisons is relatively isolated from the rich theory and practice of benchmarking. Today, we can observe national reports based on simple comparisons of indicators that are referred to as benchmarking studies; these include *Benchmarking the Framework Conditions: A Systematic Test for Belgium* (Courcelle & De Vil, 2001) and *Benchmarking Slovenia: Evaluation of Slovenia's Competitiveness, Strengths and Weaknesses* (Petrin et al., 2000). The essence of the benchmarking concept are evident in these studies because the indicators are compared with leading, comparable, or competitive countries.

Similarly, within the European Union, the notion of benchmarking has become a standard term for comparisons of the member states. Typical examples of such research are the periodic benchmark studies on the gross domestic products per capita and per employed person. In a more advanced setting, benchmarking refers to a complex process of establishing and monitoring the standardized set of indicators of the information society (e.g., Conseil de l'Union européenne, 2000).

BENCHMARKING INTERNET

Internet and Company Benchmarking

The Internet is rapidly being integrated into every facet of organizations' overall strategy and operation. Many

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organizations have expanded their direct-to-consumer business model, employing multiple Internet strategies to customize customer information, track customer development trends and patterns, and increase customer savings as a means to build strong relationships with their customers (Best Practices, 2000, 2001; Martin, 1999). These changes have had a major impact on the benchmarking process as well.

ICT systems are not only being benchmarked, they are also the key enablers of successful benchmarking. Current ICT systems permit users to generate, disseminate, analyze, and store vast amounts of information quickly and inexpensively. When poorly managed, however, ICT can annoy customers, slow cycle times, saddle the corporation with excessive costs, and damage productivity—all to the disadvantage of the organization (Best Practices, 2001; Bogan & English, 1994, pp. 171, 188). The benchmarks that provide the comparative insight into the role of the ICT are thus extremely important, particularly because the implementation of the ICT requires long-term strategic planning and significant investment.

The process of the Internet benchmarking on the organizational level still lacks a set of universally recognized benchmarks. Nevertheless, on the basis of several sources (e.g., Benchmark Storage Innovations, 2002; Bogan & English, 1994; Haddad, 2002; Tardugno, DiPasquale, & Matthews, 2000) we can broadly classify these benchmarks into three categories.

First, when benchmarking features and functionality, indicators usually measure the following:

Characteristics of software and hardware (e.g., server, database, multimedia, networks, operating systems and utilities, security infrastructures, videoconference systems, corporate intranet and extranet, type of Internet connection and connection, download and upload speed)

Purchase of new technology (e.g., share of new computers according to the number of all computers)

Costs of technology and the organization's budget for ICT

Software and network security administration

Computer system performance (processing speeds, central processing unit efficiency, CD-ROM drive access speeds, performance analysis of networking and communications systems, reliability and performance modeling of software-based systems, error rates)

Second, while exploring the measures related to the use of ICT, an organization can measure the processes related to the outside environment, including its clients (customer-oriented benchmarks), or it can evaluate the use of ICTs within the organization (employee-oriented benchmarks). Customer-oriented benchmarks reflect the following:

- The extent to which ICTs have been incorporated into economic activity, such as use of the Internet in a company's transactions (i.e., electronic commerce)
- Types of e-business processes (such as Web sites with no transactions, Web-based e-commerce, electronic marketplace, etc.)
- The characteristics of strategic information technology projects (e.g., mobile or wireless commerce offerings; electronic supply chains; participation in electronic marketplaces; the organization's Web site capacity, performance, and usability; customer service and support infrastructure; creation of "localized" Web sites for customers in other countries, etc.)

Employee-oriented benchmarks typically examine the following:

- Key applications running in the organization
- Number of employees that use ICTs and the technical skills evolved
- Level of training provided for employees to use ICTs effectively
- Information system indicators reflecting organizational learning and continuous improvement
- Diffusion of telework
- New product development times
- Employee suggestion and process improvement rates
- Use of software (e.g., databases and telecommunication networks) by employees
- ICT usability

Third, when an organization explores the benefits attributed to the employment of Internet and other ICTs, it typically observes the following benchmarks:

- Increased efficiency, productivity, and performance of the organization
- Improved workstation comfort and job satisfaction
- Fewer problems in the production stage
- Broader customer base in existing and international markets
- More effective communication with customers, employees, and suppliers
- Fewer customer complaints
- Increased customer loyalty
- Better financial management
- Better integration of business processes

Measurement instruments and indicators used in the benchmarking process depend on the type of organization, its communication and business processes, the social context within which it operates, the characteristics of the employees and clients, and so on. Consequently, when evaluating features, functionality, use, and benefits of ICT, different practitioners focus on different benchmarks. In addition, most of the benchmarks described here can be measured from different perspectives; for example, a practitioner may concentrate on extent, intensity, quality, efficiency, mode of use, familiarity, or readiness of the certain component.

Internet and Sector Benchmarking

Sector benchmarking focuses on the factors of competitiveness, specific to a particular industry. Because of its

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Table 1 Internet Benchmarks

	A[a]	B[b]	C[c]	D[d]	E[e]	F[f]	G[g]	H[h]
ICT Infrastructure								
Number of Internet hosts	x		x	x			x	x
Percentage of computers connected to the Internet			x					
Households with access to the Internet		x		x			x	
Wireless Internet access						x		
Number of Web sites								x
Price and quality of Internet connection			x				x	
Cable modem lines per 100 inhabitants				x				
Digital subscriber lines (DSL) per 100 inhabitants				x				
Network Use								
Percentage of population that (regularly) uses the Internet	x	x	x		x	x	x	x
Internet subscribers per 100 inhabitants				x			x	
Cable modem, DSL, and Internet service provider (ISP) dial-up subscribers				x				
Hours spent online per week					x			
Mobile and fixed Internet users						x		
Primary uses of the Internet					x			
Primary place of access					x			
Perception of broadband Internet access			x					
Secure Networks and Smartcards								
Number of (secure) Web servers per million inhabitants		x		x			x	x
Percentage of Internet users with security problems		x		x				
Faster Internet for Researchers and Students								
Speed of interconnections within national education networks		x						
E-commerce								
Internet access costs		x	x	x				x
Percentage of companies that buy and sell over the Internet		x		x		x		
Percentage of users ordering over the Internet				x		x		x
Business-to-consumer e-commerce transactions (% of gross domestic product)			x			x		x
Average annual e-commerce/Web spending per buyer						x		
Internet sales in the retail sector (%)				x				
Consumer Internet purchases by product				x	x	x		
Payment methods						x		
Future e-commerce plans						x		
Business intranet sophistication			x					
Online ad placement by type of site					x			
Internet advertising revenues—source comparison					x			
Domestic venture capital investment in e-commerce			x					
Competition in dot-com market			x					
Prevalence of Internet startups			x					
Use of Internet-based payment systems			x					
Sophistication of online marketing			x					
Price as barrier of e-commerce								x
Networked Learning								
Computers connected to Internet per 100 pupils	x							
Computers with high-speed connections per 100 pupils	x							
Internet access in schools	x	x						
Teachers using the Internet for noncomputing teaching	x							
Working in the Knowledge-Based Economy								
Percentage of workforce using telework	x							
Computer workers as a percentage of total employment				x				
Participation for All								
Number of public Internet points (PIAP) per 1,000 inhabitants	x							
Availability of public access to the Internet		x						

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Table 1 (Continued)

	A[a]	B[b]	C[c]	D[d]	E[e]	F[f]	G[g]	H[h]
Central government Web sites that conform to the Web Accessibility Initiative (WAI)		x						
Government Online								
Percentage of basic public services available online		x	x					
Public use of government online services		x						
Percentage of online public procurement		x						
Government effectiveness in promoting the use of information and communication technology			x					
Business Internet-based interactions with government			x					
Health Online								
Percentage of health professionals with Internet access	x							
Use of different Web content by health professionals	x							

[a] European Information Technology Observatory, 10th ed. (2002).
[b] Benchmarking *e*Europe (2002).
[c] The Global IT Report (Kirkman, Cornelius, Sachs, & Schwab, 2002).
[d] Organization for Economic Co-operation and Development (2001, 2001a, 2002); Pattinson, Montagnier, & Moussiegt (2000).
[e] NUA (2002).
[f] International Data Corporation (2002c, 2002d.
[g] International Telecommunications Union (2001, 2001a).
[h] Benchmarking Belgium (Courcelle & De Vil, 2001).

powerful impact—which is sometimes unclear or even contradictory—it is particularly important that Internet is benchmarked within the whole sectors. The need for this practice is especially crucial in ICT-related sectors.

Typically, telecommunication companies have used benchmarking to evaluate digital versus analog technology. Benchmarks included one-time costs, maintenance costs per line, minutes of downtime per line per month, and various performance measures for processing time and failures (Bogan & English, 1994, p. 171). The Internet is being benchmarked beyond the ICT sector, however. New technologies, especially Internet-based information and service delivery, offer immense possibilities to meet a range of sector objectives. If appropriately deployed, ICT can help facilitate crucial economic and social development objectives in all sectors (World Bank Group, 2001, p. 67).

Internet and Framework Conditions Benchmarking

Framework conditions benchmarking focuses on improving the external environment in which organizations operate. One of the key elements affecting the national or regional business environment is the presence and nature of ICT. Lanvin (2002, p. xi) thus raised an important question: whether societies with different levels of development can turn the ICT revolution into an instrument that reduces the risk of marginalization and alleviates poverty. The realities in this broad and complex area require a clear assessment of how well equipped a region or country is to face the challenges of the information-driven economy (Lanvin, 2002, p. xi). So, before an action is taken, the so-called digital divide among less developed countries and the most developed countries or regions must be estimated. In other words, only when standardized indicators are available can the challenge of bridging the global digital divide be addressed.

INTERNATIONAL COMPARISONS

In this section, the key Internet indicators related to country comparisons are presented, together with their methodological specifics. The international organizations and projects that collect or present these data are briefly introduced.

Standardized Internet Benchmarks

From a technological perspective, the Internet is a global network of computers with a common communicating protocol. The corresponding social consequences of this phenomenon are extremely complex, however so we cannot avoid the benchmarks that relate not only to the Internet but also those linked to other ICT and to society. Of course, the line between the Internet and more general ICT benchmarks may be relatively vague. We limit the discussion here only to those benchmarks that are closely linked to the Internet.

In recent years, there has been a great deal of conceptual discussion about measuring Internet and the information society. The rapidly changing phenomena in this area have also challenged the process of scientific production, particularly in the social sciences, as well as the production of official statistical indicators. In last few years, however, the key Internet-related benchmarks converged to form relatively simple and commonsense standardized indicators (Table 1). This simplification corresponds to a relative loss of the enthusiasm for the so-called new economy, information society, and new business models that has recently occurred.

The quest for standardized indicators for Internet benchmarking has perhaps been strongest in the EU. In

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part, this is because the EU's official and ambitious goal is to surpass the United States within the next decade as the technologically most advanced society. In addition, the EU urgently needs valid comparisons among its 15 members as well as the 10 countries that will join in 2004. In addition to official EU documents regulating the standards for information society benchmarks (Benchmarking eEurope, 2002), a variety of research projects have emerged, one of the most comprehensive of which is the EU research program Statistical Indicators Benchmarking the Information Society (SIBIS, 2002). The conceptual framework for statistical measurements used by SIBIS was extensively developed for all key areas of the ICT-related phenomena—from e-security and e-commerce to e-learning, e-health, and e-government.

Currently, of course, only a small portion of the proposed indicators is being collected. Table 1 roughly summarizes only the key and most often applied benchmarks in the field of Internet-related country comparisons. In compiling the list, we sought a balance between Internet and the related ICT benchmarks and tried to avoid more general ICT indicators, such as those from the broad field of telecommunications.

The columns in Table 1 relate to the selected organizations that have published these data. Of course, the work of many other organizations was omitted because of space limitations and the scope of this chapter. Only the key international bodies and projects that systematically collect and present Internet benchmarks are listed. In addition, we also included two examples of the private companies, NUA (www.nua.com), which was one of the first to collect secondary data on worldwide Internet users (column E), and the International Data Corporation (IDC; www.idc.com), the leading global consulting agency specializing in international ICT studies (column F). In the last column (column H), the example of the benchmarks included in a typical national report (e.g., Belgium) on ICT is presented (Courcelle & De Vil, 2001). We now briefly describe the sources of the data in the Table 1.

European Information Technology Observatory (EITO)

This broad European initiative has as its objective the provision of an extensive overview of the European market for ICT within a global perspective. EITO publishes a yearbook that presents the most comprehensive and up-to-date data about the ICT market in Europe, together with the global benchmarks, particularly those related to United States and Japan (EITO, 2002). The majority of benchmarks that measure financial aspects (e.g., ICT investments) rely on data gathered by IDC. From the beginning the EITO has been strongly supported by the European Commission, Directorate General Enterprise, and Information Society, and since 1995 also by the Directorate for Science, Technology and Industry of the OECD in Paris (EITO, 2002). The annual EITO reports include the key benchmarks and also in-depth discussion of the contemporary ICT issues.

Benchmarking *e*Europe

This is the official European Union benchmarking project in the filed of ICT, begun in November 2000, when the European Council identified 23 indicators to benchmark the progress of the *eEurope Action Plan*. Indicators measure many aspects of ICTs, including e-commerce, e-government, e-security, e-education, and e-government. The facts and figures from this benchmarking program will be used to evaluate the net impact of *e*Europe and the information society, to show the current levels of activity in key areas, and to shape future policies by informing policy makers (Benchmarking *e*Europe, 2002).

The Global Information Technology Report (GITR) 2001–2002

Readiness for the Networked World is a project supported by the Information for Development Program (*info*Dev, http://www.infodev.org), a multidonor program administered by the World Bank Group (Lanvin, 2002, p. xi; World Bank Group, 2001, p. iii). At the core of the GITR is the *Networked Readiness Index,* a major comparative assessment of countries' capacity to exploit the opportunities offered by ICTs. *The Networked Readiness Index* provides a summary measure that ranks 75 countries on their relative ability to leverage their ICT networks.

Organization for Economic Co-operation and Development

The OECD groups 30 countries sharing a commitment to democratic government and the market economy. With active relationships with some 70 other countries, nongovernmental organizations, and civil societies, the OECD has a global reach. Best known for its country surveys and reviews, its work covers economic and social issues from macroeconomics to trade, education, development, and science and innovation. The OECD produces internationally agreed upon instruments to promote rules of the game in areas in which multilateral agreement is necessary for individual countries to make comparisons and progress in a global economy. Within OECD, the Statistical Analysis of Science, Technology and Industry is also conducted, together with the development of the international statistical standards for this field. Among other responsibilities, the OECD's work in this area seeks ways of examine and measure advances in science and technology and reviews recent developments in information and communication technologies (OECD, n.d.). Several internationally comparable indicators are formed within the field of the information economy, such as resources and infrastructure for the information economy, the diffusion of Internet technologies and electronic commerce, ICTs (software and hardware). The OECD also established The Committee for Information, Computer and Communications Policy (ICCP), which addresses issues arising from the digital economy, the developing global information infrastructure, and the evolution toward a global information society. In 2002, OECD published the *OECD Information Technology Outlook,* which provides a comprehensive analysis of ICTs in the economy, ICT globalization, the software sector, e-commerce, ICT skills, the digital divide, technology trends, and information technology policies.

NUA Internet Surveys

As a global resource on Internet trends, demographics, and statistics, NUA offers news and analysis updated weekly. It compiles and publishes Internet-related survey

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information from throughout the world. NUA is particularly known for its unique "How Many Online?" feature, which offers an estimate of the global Internet user population based on extensive examination of surveys and reports from around the world (NUA, n.d.). The value and importance of this work rapidly diminishes as more reliable and standardized indicators have begun to appear.

International Data Corporation (IDC)

IDC is a commercial company and the world's leading provider of technology intelligence, industry analysis, market data, and strategic and tactical guidance to builders, providers, and users of IT (IDC, n.d.). Thus, IDC is perhaps the most reliable global source for the number of personal computers sold in certain country or region. In addition to individual research projects and more than 300 continuous information services, IDC also provides a specific Information Society Index (ISI), which is based on four infrastructure categories: computer, information, Internet, and social infrastructures. The ISI is designed for use by governments to develop national programs that will stimulate economic and social development. It is also a tool for IT, dot-coms, and asset management and telecommunications companies with global ambitions to assess the market potential of the various regions and countries of the world (IDC, 2002a, 2002b).

International Telecommunication Union (ITU)

Headquartered in Geneva, Switzerland, ITU is an international organization within the United Nations System in which governments and the private sector coordinate global telecom networks and services. Established in 1865, ITU is the one of the world's oldest international organization. ITU's membership includes almost all countries and more than 500 private members from telecommunication, broadcasting, and IT sectors. ITU regularly publishes key telecommunication indicators, including the Internet-related benchmarks (ITU, n.d.).

Benchmarking Belgium

Benchmarking Belgium (Courcelle & De Vil, 2001) is a typical national ICT benchmarking study with the goal of comparing ICT developments in Belgium with comparable countries.

Other organizations also provide international Internet-related benchmark indicators. The indicators are usually similar to those already covered in Table 1, however. A brief listing of the most important of these follows.

The *Human Development Report,* commissioned by the United Nations Development Programme (UNDP), covers more than 100 countries annually. In 2001, the report was titled *Making New Technologies Work for Human Development*. It presents statistical cross-country comparisons that have been built up through cooperation of many organizations (e.g., several UN agencies, OECD, ITU, the World Bank). Report contains many composite indexes, such as the technology achievement index designed to capture the performance of countries in creating and diffusing technology and in building a human skills base (UNDP, 2001).

United Nations Industrial Development Organization (UNIDO) benchmarked a set of industrial performance and capability indicators and ranked 87 countries. *The Industrial Development Report 2002/2003* is intended to help policy makers, business communities, and support institutions assess and benchmark the performance of their national industries and analyze their key drivers (UNIDO, 2002).

Benchmarking is also relevant to the United Nations Educational, Scientific and Cultural Organization (UNESCO), particularly within the field of higher education. UNESCO has established Observatory of the Information Society with the objectives of raising awareness on the constant evolution of ethical, legal, and societal challenges brought about by new technologies. It aims to become a public service that provides updated information on the evolution of the information society at the national and international levels (WebWorld, 2002).

In 2001 The World Bank Group gathered data that allow comparisons for almost all existing countries available in the World Development Indicators database. Included are also indicators that measure infrastructure and access, expenditures, and business and government environment in relation to ICT.

In the United Kingdom, the Department of Trade and Industry (DTI) has sponsored research on levels of ownership, usage, and understanding of ICTs by companies of all sizes and within all sectors in benchmarked countries. The report Business in the Information Age benchmarks businesses in the United Kingdom against those in several European countries, the United States, Canada, Japan, and Australia (DTI, 2002). Also in the United Kingdom, the Office of Telecommunications (2002) issued the International Benchmarking Study of Internet Access, covering both basic dial-up access and broadband services (i.e., DSL and cable modem).

The number of institutions that publish some Internet-related measurements on international level is higher each year. It is hoped that this will also lead to accelerated establishment of standardized instruments for statistical comparisons.

Technical Measurements

The benchmarks presented in Table 1 included almost none of the performance metrics of ICT infrastructure, although they are extremely important Internet benchmarks. The technical benchmarks related to the ICT infrastructure predominantly include specific information on computers. Also relevant are the characteristics of modems and the type of Internet connection. Here, some of the most interesting benchmarks also overlap with those already outlined in the Internet and Company Benchmarking section (i.e., the type of software and hardware).

One of the central devices for the Internet technical measurement is the Internet host, where the measurements relate to corresponding speed, access, stability, and trace-route. The speed is usually expressed in the amount of information transmitted per second. Beside technical characteristics of modems and computers, the processing speed is determined by network speed between the hosts,

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which depends on the Internet service providers' and national communication infrastructures. In particular, the *capacity* of the total national communication links is often used as an important benchmark for the country comparisons. The access and stability are related concepts; *stability* is checked on a local level and is defined in terms of host's interruptions. The *access* stands for stability on a global level; it tells us how accessible the host is from one or more points in the Internet network. Also important are the *trace-route* reports, in which we can observe the path where data packets travel as they leave the user's computer system. More direct routes to the key international communication nodes may indicate better national infrastructure.

THE METHODOLOGICAL PROBLEMS

Of course, because of their newness, all Internet benchmarks are relatively unstable and typically face severe methodological problems. This is understandable, because these phenomena occurred relatively recently and therefore little time has been available for the discussion of methodological issues. Often, they also exhibit extremely high annual growth rates, measured in tens of percentages. In addition, the new technological improvements continuously change the nature of these phenomena and generate a permanent quest for new indicators. As a consequence, in mid-1990s this rapid development almost entirely eliminated the official statistics from this area. Instead, the private consulting agencies took the lead in ICT measurements. Thus, for example, the IDC produces many key internationally comparable data on the extent and structure of the ICT sectors.

In last few years, the efforts in official statistics and other noncommercial entities took some important steps toward compatibility. The activities within OECD particularly in Scandinavian countries, Australia, Canada, and the United States, have been particularly intensive. The United States took the lead in many respects, what was due not so much to the early Internet adoption but to early critical mass achieved in that country. In the United States, there were already millions of the Internet users by mid-1990s, a fact that many commercial organizations considered worthy of research. The U.S. government also reacted promptly, so, for example, in addition to numerous commercial measurements, official U.S. Census Bureau figures are available for business-to-customer and business-to-business sales from the end of the 1990s. The EU, in comparison, is only in the process of establishing these measurements for 2003. With respect to more sociological benchmarks, the National Telecommunications and Information Administration (2002) conducted pioneering research on the digital divide. The Pew Research Center (n.d.), a U.S. nonprofit organization, conducts important research that sets standards for sociological Internet benchmarks.

In the reminder of this section, we discuss some typical methodological problems related to the Internet benchmarks. The discussion is limited to the two most popular benchmarks in the field of Internet-related national performance: the number of Internet users and the number of Internet hosts. We believe that the methodological problems are very much typical for other indicators listed in Table 1.

Number of Internet Users

The number of Internet users heavily depends on the definition applied, an issue for which three methodological problems can be cited.

1. The Specification of Time

When defining the Internet user, usage during the last three months is often applied (NUA, 2002). Even more often, the Internet user is defined with simple self-classification, in which a question such as "Do you currently use the Internet" is asked on a survey. Experience shows that a positive answer to this question results in about 3–5% overestimation compared with questions asked among monthly users (e.g., people who claim to use the Internet on a monthly basis). Typically, usage during the last three months reveals up to a third more users compared with the category of monthly users. In the case of weekly users, which is another important benchmark, the figure shrinks to about one fifth compared with monthly Internet users. A huge variation thus exists in the number of Internet users only because of the specified frequency of usage. In addition, when asking for the Internet usage from each location separately (e.g., home, school, job), the figure increases considerably compared with asking a general question that disregards location. The timing of the survey has also a considerable impact: February figures can dramatically differ from the November figures of the same year. Unfortunately, the explicit definitions (e.g., working, timing) applied are typically not clearly stated when numbers of Internet users are published.

2. The Base and Denominator for Calculating Percentages

The number of Internet users is often observed as a share within the total population. This may be a rather unfair comparison because of populations' varying age structures and may produce artificially low figures for certain countries. Instead, often only the category 18+ is included in research, particularly in the United States. In Europe, users older than 15 years (15+) have become the standard population. The population aged 15 to 65 is also used as a basis for calculations, whereas media studies usually target the population aged 12 to 65 or 10 to 75. For a country with Internet penetration reaching about a quarter of the population, discrepancies arising from varying target populations (e.g., the basis in the denominator) vary dramatically, from the lowest Internet penetration of 20% in the population 15+ to the highest penetration of 30% in the population aged 15 to 65.

3. Internet Services Used

When asking about the Internet usage, typically only the Internet is mentioned in the survey question. Increasingly often the definition explicitly includes also the usage of the e-mail. However, here we instantly face the problem of non-Internet-based email systems. Some other definitions also include Wireless Application Protocol and other mobile Internet access methods as well as WebTV. No

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common international standards have been accepted. An attempt to establish such guidelines may be jeopardized with the emerging and unpredictable devices that will enable the access to the Internet. In the future, the definitions will have to become much more complex, so the potential danger for improper comparisons will also increase. The development of the standardized survey question is thus extremely important.

In addition to the these three problems, we should add that the number of Internet users is typically obtained from some representative face-to-face or telephone survey, which creates an additional and complex set of methodological problems related to the quality of survey data (sample design issues, nonresponse problems, etc.).

Another approach to estimate the number of Internet users is through models in which the number of Internet hosts and other socioeconomic parameters (i.e., educational statistics, gross domestic product) come as an input. This may be a problematic practice. A much more promising approach are so-called PC-meter measurements, in which the representative sample of Internet users is determined by installing a tracking software that records a person's Internet-related activities (e.g., Nielsen-Netratings, MediaMatrix). Despite serious methodological problems—particularly due to the non-household-PC access (i.e., business, school) and non-computer access (i.e., mobile)—this approach seems to be one of the most promising. The key advantage here is that it is not based on a survey question but on real-time observations. Another advantage is the convenience arising from the fact that the leading PC-meter companies already perform these measurements on a global level.

Number of Internet Hosts

The number of Internet hosts is perhaps the most commonly used Internet benchmarks. The reason for this is a relative easiness of its calculation and the regular frequency of these measurements. The Network Wizards (http://www.nw.com/) and Réseaux IP Européens (RIPE) (http://www.ripe.net/) are typical examples of the organizations that gather these kinds of statistics. There are severe methodological problems related to these measurements, however.

Device

The term "host" usually relates to a device that is linked to the Internet and potentially offers some content to the network. It also relates to a device with which users access the Internet. During an Internet session, each device has its Internet Protocol (IP) number. The device is typically a computer; however, it can also be a modem used for a dial-up access. In the future, other devices—mobile phones, televisions, and perhaps even home appliances such as refrigerators—will also have IP numbers. National differences in the structure of those devices may post severe problems for international comparisons. Some other national specifics may also have some impact, such as a relatively large number of IP numbers partitioned on one server.

Dial-Up Modems

The most critical type of the host device is a dial-up modem, which usually serves about 100 users (e.g., households or companies) monthly. As a consequence, in each session the dial-up user connects to the Internet through a different and randomly selected modem (IP number). In countries with larger numbers of dial-up access users, the host count may underestimate the reach of the Internet.

Proxy Servers

In businesses and organizations, one computer or server may be used as the proxy host for Internet access for all computers within the local network. All the users (e.g., employees) may appear to use the same host number. Countries with a large number of such local networks may underestimate their Internet penetration.

Domain Problems

In host count statistics, all the hosts under a country's national domain are attributed to that country. The countries with restrictive domain-registration policies force their subjects to register their domains abroad, however. Consequently, a considerable number of hosts may be excluded from the national domain count. The Slovenian example is typical. Until 2003, only a company's name and trademark could receive the national domain name ".si," so up to one third of all hosts are registered under ".com," ".net," and other domains. It is true that with some additional procedures, the hosts can be reallocated to the proper country, as is typically done for the OECD. This requires additional resources, however, and is not available in the original host count data.

Technical Problems

The host count measurements are basically performed with a method "pinging" in which the computer signal is sent to a certain host number. Because of increased security protection for the local networks, the methodologies must be permanently adopted. Thus, for example, a few years ago the Network Wizards (NW) had to break the original time series of its measurements with a completely new measurement strategy. The differences between RIPE and NW are also considerable for certain countries. Local measurements can be somewhat helpful here; however, the regional or national partner may not report regularly, so a large dropout rate may result, as was often the case with RIPE data for Italy. There is also the problem of global commercial hosting, in which businesses from one country run their Web activities in the most convenient commercial space found in another country.

In the future, the host count measurement will have to upgrade measurement techniques continuously, and there will always remain certain limitations when inferring national Internet development from host count statistics.

These methodological problems related to Internet users and hosts also affect other benchmarks listed in Table 1. Thus, a general warning should be raised when using this kind of data. In particular, the methodological description must be closely observed.

Despite severe methodological problems, the national benchmarks in Table 1 offer reasonable and consistent

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results. Of course, with certain countries additional factors must be considered in the interpretation of data. In the future, because of the increased need for standardized, stable, and longitudinal benchmarks, we can expect that at least some of them will become standard. Another reason for this is that many phenomena have already profiled themselves and settled down in a stable and standardized form. For others, and particularly for new methods, users may have to struggle through the certain period of ambiguity during which no standardized or official indicators are available.

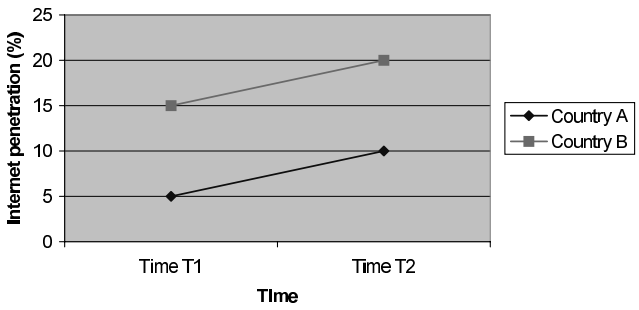

Figure 1: Internet penetration in Time 1 and in Time 2.

THE DIMENSION OF TIME

Benchmark comparisons are usually performed within time framework, so this benchmarking dimension is of great significance. Observing benchmarks through time can be extremely problematic because the straightforward comparisons of fixed benchmarks may not suffice in a rapidly changing environment.

As an example, the increase in Internet penetration from 5% in Time T1 to 10% in Time T2 for Country A demonstrates the same absolute increase in penetration as experienced by Country B with the corresponding increase from 15% (T1) to 20% (T2). In an absolute sense, one could say there had been an identical increase in Internet penetration (e.g., 5%). Similarly, the gap between the countries remains the same (e.g., $15 - 5 = 10\%$ in time T1 and $20 - 10 = 10\%$ in time T2).

In a relative sense, however, the increase in Country A from T1 to T2 was considerably higher:—$(10 - 5)/10 = 50\%$, compared with $(15 - 10)/15 = 33\%$ in Country B. Similarly, the amount of the relative difference between the countries dramatically shrunk from $(15 - 5)/15 = 75\%$ at T1 compared with $(20 - 10)/20 = 50\%$ in T2. Correspondingly, at T1 Country A reached $15 - 5/15 = 33\%$ of the Internet penetration of country B, whereas at T2 it already had reached $(20 - 10)/20 = 50\%$ of the penetration in Country B.

It is only a matter of subjective interpretation whether the differences in Internet penetration between the two countries remained the same (e.g., 5%) or decreased (e.g., Country A is reaching 50% of the penetration of Country B at T2 instead of only 33% at T1). Paradoxically, as will be shown later, the gap from T1 to T2 between these two countries most likely increased.

Of course, these differences may seem trivial because they refer to the usual statistical paradoxes, which can be dealt with a clear conceptual approach about what to benchmark together with some common sense judgment. It is much more difficult to comprehend and express the entire time dimension of the comparison in this example. The fact is that all the information regarding the time lag between the countries cannot be deduced directly from these data (Figure 1). To evaluate the entire time dimension, one would need the diffusion pattern of the Internet penetration or at least some assumptions about it. Typically, we assume that at T2 Country A will follow the pattern of Country B (Sicherl, 2001). For Figure 1 we could thus deduce, using a simple linear extrapolation, that Country A would need $2 \times (T2 - T1)$ time units (i.e. years) to reach the penetration of the country B at T2, what is usually labeled as a time distance between the two countries.

It is also possible, however, that at T1 Country A will need, for example, 3 years to reach the penetration of Country B at T1, whereas at T2, Country A may need 5 years to reach Country B's penetration at T2. Such an increase in lag time is expected for Internet penetration because its growth is much higher during the introductory period. Typically, much less time is needed for an increase in penetration from 5 to 10% compared with an increase from 55 to 60%. The opposite may also be true, however, as the differences in time may shrink from 3 years at T1 to 2 years at T2; it depends on the overall pattern of the Internet diffusion process.

Figure 2 demonstrates these relationships for the case of the two-dimensional presentation of the host density (the number of Internet hosts per 10,000 habitants) for Slovenia and the EU average (1995–2001). We expressed the Slovenian relative host density as the percentage of the density reached in the EU as the first dimension. The other dimension expresses the differences in terms of time distance, that is, the number of years Slovenia would need to catch up to the EU average. The method of time distance, which extrapolates the existing growth to the future, was applied here (Sicherl, 2001). In July 1995, Slovenia reached almost 40% of the EU average and in January 1997, it reached almost 90%, whereas in January 2001, it returned to 40% of the EU average. On the other hand, the corresponding time lag increased from about 1 year in 1995 to more than 3 years in 2001. The same figure for the relative benchmark (e.g., 40% in 1995 and

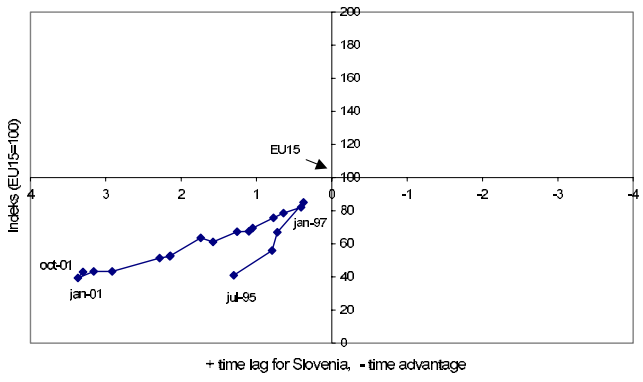

Figure 2: Host density in Slovenia and EU (1995–2002). Source: Sicherl (2001)

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in 2001) has thus a dramatically different interpretation in terms of the time distance (e.g. 1 year and 3 years). The discrepancy can be explained by the fact that it was much easier to expand growth in 1995 when yearly growth rates in hosts' density were over 100% and the EU average was around 20 hosts per 10,000 habitants, compared to 2001 when the yearly growth rate were only around 10% or even stagnating, and the average of the host density was 40 hosts per 10,000 inhabitants.

Obviously, the Internet benchmarks should be observed within the framework of changing penetration patterns. Any benchmark that relies only on the comparisons of absolute or relative achievements may not be exhaustive in explaining the phenomena. It can be even directly misleading. This example illustrates that benchmark researchers must take the time dimension into careful consideration.

CONCLUSIONS

The basic concept of benchmarking relates to comparisons of performance indicators with a common reference point. Historically, such comparisons have been performed since the time of the ancient Egyptians. The systematic collection of the benchmarks also existed from the early days of the competitive economy, when companies compared their business practices with those of competitors. The explicit notion of benchmarking arose only in the late 1970s with the pioneering work of Xerox, however, and interest in the field exploded in the 1990s. Today benchmarking is an established discipline with professional associations, awards, codes of conduct, conferences, journals, and textbooks, and companies around the world are involved in the practice.

There are no doubts that modern benchmarking arose from a business environment where all the basic methodology and the standard procedures were developed. However, during past years the notion of benchmarking has expanded to sector benchmarking as well as to the governmental and nonprofit sector. In last few years it has also become popular for the national comparisons in the field of ICT. A number of international studies have been labeled as benchmarking, although little benchmarking theory was actually applied (Courcelle & De Vil, 2001; Petrin et al., 2000). The EU adopted benchmarking for ICT comparisons of member and candidate nations in a formal manner. In this case, statistical data are used for systematic year-by-year comparisons according to 23 Internet benchmarks.

The speed of changes in the field of ICT creates severe methodological problems for the Internet benchmarks. With the dramatic rise of the Internet in mid-90s only private companies had sufficient flexibility to provide up-to-date ICT indicators. As a consequence, even today, for the ICT international comparisons the data from private agencies are often used. In particular, this holds true for the scope and structure of the ICT spending. Only in recent years have the official statistics and other international bodies recovered from this lag and presented their own methodological outlines. Here, the work within EU and particularly within the OECD should be emphasized.

The contemporary Internet indicators used for the international comparisons of the countries' performance have stabilized only in recent years. After many theoretical discussions about the complexity of the information society, relatively simple indicators became the standards for the national ICT benchmarking. Among the key indicators in this field are the Internet penetration, the host density, and the share of Internet transactions among all commercial transactions of consumers and companies as well as within the government–citizen relations.

GLOSSARY

Benchmark A reference point, or a unit of measurement, for making comparisons. A benchmark is a criterion for success, an indicator of the extent to which an organization achieves the targets and goals defined for it.

Benchmarking A process whereby a group of organizations, usually in the same or similar domains, compare their performance on a number of indicators. The aim of the exercise is for participants to learn from each other and to identify good practice with a view toward improving performance in the long run.

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