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COMPETITIVENESS IN THE NEW ECONOMY*

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ABSTRACT: This paper devises an e-competitiveness index attempting to measure *the ability of a nation to exploit information and communication technology (ICT) to the fullest*. Results of the analysis show that Finland is highly specialized in ICT provision, it has good premises to exploit ICT to the fullest, but that it is *not* amongst the leading users of ICT.

KEYWORDS: Internet, ICT, IT, new economy, competitiveness, e-competitiveness.

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1. INTRODUCTION

Castells & Himanen (2001, p. 6) argue that

The world is being transformed by the information-technology revolution, the diffusion of the new economy on a global scale, and the rise of the network society.

They postulate three viable models for the rising information society: the Silicon Valley model, the Singaporean model and the Finnish model.

Finland, Singapore, and the United States are also amongst the most competitive countries in the world according to the authoritative reports of *International Institute for Management Development* (IMD, 2001, www.weforum.org/gcp) and *World Economic Forum* (WEF, 2001, www.imd.ch/wcy). Is this a coincidence or is there some resemblance between competitiveness and the viability of the “national model for the information society”?

This note discusses aspects of national competitiveness in the rising information society (also referred to as, *e.g.*, the knowledge society, the network society, e-economy, digital economy, intangible economy, Internet economy, weightless economy, and the new economy).

Section 2 discusses, what exactly is meant by competitiveness in the new economy. Section 3 takes a “new economy” perspective on the competitiveness indices by IMD and WEF. Section 4 briefly presents the *IDC/World Times Information Society Index* and devises an alternative e-competitiveness index along with three sub-indices. Section 5 concludes.

2. COMPETITIVENESS & THE NEW ECONOMY

In established markets of commodity-like goods or services, the concept of competitiveness reduces to a firm's ability to profitably provide its offerings at the going market rate. In practice markets where competitiveness can be reduced to this price/cost dimension are quite rare.

In most established markets competition among firms takes non-price forms: for real (*e.g.*, longer service life) or imaginary (*e.g.*, branding) reasons customers are willing to pay for a given good or service, although a less costly alternative could in principle fulfill the same need. As compared to *cost competitiveness* above, competition over "desirability" in established markets (sometimes referred to as *real competitiveness*) is a multi-dimensional concept and cannot be readily compressed to a single measure. The picture is further complicated by the fact that many firms operate in a number of markets simultaneously, with the objective of maximizing *overall* discounted profits. A second complication is that firms do not only compete in established markets, they also compete *for* the introduction previously unavailable goods and/or services, spawning completely new markets. This may be referred to as *innovative competitiveness*.

As can be inferred from the above discussion, at least in some special cases competitiveness at the firm level can be meaningfully defined and even measured. It is indeed firms, rather than industries or nations, competing in the marketplace. Despite of the fact that nations do not, with the possible exceptions of sporting events, compete directly, *national competitiveness* nevertheless remains a popular notion.

In principle the firm-level notions of cost, real, and innovative competitiveness can be extended to the national level in a straightforward manner. Cost competitiveness relates to relative factor prices across nations, real competitiveness relates to the ability of the firms operating within the nation's borders to compete over "desirability" in established global markets, innovative competitiveness relates to the ability of the firms to spawn completely new global markets. In a sense this approach summarizes competitiveness in question across the firms. At least two problems arise with this approach. *First*, although most firms have an identifiable home base, increasingly often they lack clear national identity. *Second*, even if the home base can be identified, at least on paper it can be changed almost instantly.

But the ultimate objective of a nation state is *not* to be competitive in any of the above dimensions *per se*. The goal is rather to maximize the (discounted?) welfare of current and future citizens over an infinite planning horizon. Countries should compete in carrying out this mission in the best possible manner. At a slightly more practical level the objective might be to achieve and sustain the highest possible (and 'fairly' distributed?) GDP per capita. This may in turn be realized via, *e.g.*, offering a national system of innovation that promotes real and innovative competitiveness of domestic business activities. Practical policy decisions may relate to the allocation of funds to high education and academic research, and to the formulation of incentive mechanisms promoting work and entrepreneurship.

The objective of a nation state does not necessitate comparison across countries. Since a country's success in fulfilling its mission cannot be objectively measured, a second best alternative is to evaluate, how well the country is doing relative to others.

Any exercise attempting to *measure* national competitiveness obviously has to define the concept in more practical terms. The afore-mentioned authorities on competitiveness define the term as follows:

- IMD's *World Competitiveness Index* (WCI) "... measures and compares how countries are doing in providing firms with an environment that sustains the domestic and global competitiveness of the firms operating in their borders." (Rosselet, 2001, p. 50).
- WEF's *Current Competitiveness Index* (CCI) "... evaluates the underlying conditions defining the *current* level of productivity..." (Porter, Sachs, & McArthur, 2001, p. 21).
- WEF's *Growth Competitiveness Index* (GCI) "... aims to measure the capacity of the national economy to achieve sustained economic growth over the medium term, controlling for the current level of economic development..." (McArthur & Sachs, 2001, p. 32).

According to Garelli (2001, p. 43), the "official" OECD definition of national competitiveness is as follows:

the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term.

The above definitions differ, among other things, in their orientations towards consumers (citizens) and firms. The OECD definition reaches a balance between the two. In fact the *pro* firm attitude can be seen as a tool for reaching the ultimate objective of welfare maximization. At least the first two definitions clearly identify the *systemic nature* of national competitiveness: countries compete in providing an attractive environment for private enterprise, *i.e.*, the nature of competition is indirect and the battle takes place via a multitude of channels.

Information and communication technology (ICT), globalization, and organizational changes are at the heart the *new economy* (for discussion see Koski, Rouvinen, & Ylä-Anttila, 2001). It can be considered a technology-driven revolution, the origins of which can be traced back to microelectronics advances in the 1970s. These advances have in part been driven by globalization; in part these advances have made it possible to spread firms' business activities across the globe. Organizational changes enter the picture because, as such, even revolutionary technologies are of limited economic value – their full potential is often realized only after accompanied with complementing organizational innovations. But does the new economy relate to competitiveness?

Overall technology has a considerable role in the competitiveness indices by IMD and WEF – for instance in GCI the subsection titled "Technology" has a 50% weight in the overall results.¹ ICT is obviously only a subheading, albeit an important one, of technology. Technology, and ICT as a major part of it, relates to cost, real, and innovative competitiveness because it relates to the ability to come up with organizational and process as well as incremental and radical product innovations. Technology can also increase the welfare of citizens directly by enabling easier and/or more meaningful living. In the new economy context competitiveness could be defined as *the ability of a nation to exploit ICT to the fullest*.

3. IMD & WEF ON COMPETITIVENESS – A NEW ECONOMY PERSPECTIVE

Rouvinen (2001) has summarized the key aspects of the three competitiveness indices, so we proceed with the discussion on the “new economy” interpretation of these measures.

WCI, CCI, and GCI compress a number of ‘hard’ (statistical) and ‘soft’ (executive opinion survey) indicators to a single measure of competitiveness. The overall number of included indicators ranges from 32 to 223. In what follows, the new economy indicators are defined as those most directly related to ICT. The overall number of ICT indicators ranges from 5 to 12. These indicators account for 5.4–31.3% of all included indicators. The relative *weight* of ICT is the highest in GCI, roughly one fourth.

The ICT indicators included in WCI are as follows (the Finnish ranking among the 49 countries in parenthesis):

- 4.2.01. Investment in telecommunications per GDP (31.),
- 4.2.02. Telephone main lines per capita (17.),
- 4.2.03. Cellular mobile telephone subscribers per capita (1.),
- 4.2.04. Cost of a 3-minute peak-time phone call to the United States (30.),
- 4.2.05. Country's share of computers in use worldwide (26.),
- 4.2.06. Computers per capita (3.),
- 4.2.07. Country's share of computer power worldwide (22.),
- 4.2.08. Computer power per capita (3.),
- 4.2.09. Internet users per capita (6.),
- 4.2.10. New information technology in the country meets business requirements (1.),
- 4.2.11. Ecommerce in the country is sufficiently developed for business (1.), and
- 4.2.12. Information technology skills are available in the country's labor market (10.).

The last three are derived from IMD's executive opinion survey; the remaining nine are collected from various secondary sources.

All of the ICT indicators in CCI are derived from WEF's executive opinion survey (the Finnish ranking among the 75 countries in parenthesis):

- 4.01. Speed and cost of Internet access (1.),
- 5.08. Telephone/fax infrastructure quality (1.),
- 9.11. Local availability of information technology services (2.),
- Availability and cost of cellular phones (2.), and
- Laws relating to information technology (1.).

The last two indicators are unnumbered, because they are not included in WEF's report but are nevertheless used in calculations.

ICT indicators in GCI are as follows (the Finnish ranking among the 75 countries in parenthesis):

- 4.03. Internet access in schools (1.),
- 4.07. Quality of competition in ISP sector (1.),
- 4.08. Government prioritization of ICT (2.),
- 4.09. Government success in ICT promotion (2.),
- 4.11. Laws relating to ICT use (1.),
- 4.13. Cellular telephones per capita (5.),
- 4.14. Internet users per capita (7.),
- 4.15. Internet hosts per capita (3.),

- 4.16. Telephone lines per capita (15.), and
- 4.17. Personal computers per capita (7.).

The first five are 'soft' and the last five are 'hard' indicators.²

Table 1 presents the results of recalculations of the competitiveness indices from a "new economy" perspective by including only the afore-mentioned variables. Finland retains its top ranking in WEF's current (CCI) and growth (GCI) competitiveness indices, but in fact drops one notch in IMD's world competitiveness index (WCI) – the United States, Sweden, and Iceland are ahead of Finland. It is noteworthy, that Finland succeeds considerably better in 'soft' (1st or 2nd) than in 'hard' (6th or 7th) data rankings – either Finnish respondents of the executive opinion surveys are overly optimistic, trying to promote the ranking of their host country, or the Finnish strengths indeed lie in factors that are not captured in the chosen 'hard' indicators.

Table 1: IMD & WEF Competitiveness Indices – A "New Economy" Interpretation.

	WCI	CCI	GCI
Indicators, total:	223	67	32 or 34
Indicators, hard:	118	1	14 or 15
Indicators, soft:	105	66	18 or 19
Indicators, ICT total:	12	5	10
Indicators, ICT hard:	9	–	5
Indicators, ICT soft:	3	5	5
Rank: Finland 2001 – Reported:	3	1	1
Rank: Finland 2001 – ICT Indicators only, total:	4	1	1
Rank: Finland 2001 – ICT Indicators only, hard:	7	6	–
Rank: Finland 2001 – ICT Indicators only, soft:	2	1	1

Source: IMD (2001), WEF (2001), author's calculations.

4. COMPETITIVENESS IN THE NEW ECONOMY – STEPS BEYOND

World times (www.worldpaper.com) and IDC (www.idc.com) have *devised Information Society Index (ISI)* measuring

- ... 55 nations' abilities to participate in the information revolution.
- ... nations... ability to access and absorb information and information technology.
(<http://www.worldpaper.com/2001/jan01/ISI/2001%20isi%20in%20Brief.html>).

The following variables (<http://www.worldpaper.com/2001/jan01/ISI/2001%20isi%20Variables.html>) are included in ISI:

- Computer infrastructure:
 - PCs installed per capita,
 - Home PCs shipped per household,
 - Government and commercial PCs shipped per non-agricultural workforce,
 - Educational PCs shipped per student and faculty,
 - Percent of non-home networked PCs, and
 - Software vs. hardware spending.
- Information infrastructure:
 - Cable subscribers per capita,
 - Cellular phone ownership per capita,
 - Cost for phone call,
 - Fax ownership per capita,
 - Radio ownership per capita,
 - Telephone line error rates,
 - Telephone lines per household, and
 - TV ownership per capita.
- Internet Infrastructure
 - Business Internet users per non-agricultural workforce,
 - Home Internet users per household,
 - Education Internet users per student and faculty,
 - eCommerce spending per total Internet users.
- Social Infrastructure:
 - Civil liberties,
 - Newspaper readership per capita,
 - Press freedom,
 - Secondary school enrollment, and
 - Tertiary school enrollment.

The indicators included in ISI appear quite intuitive. The index should capture relatively well the diffusion of ICT infrastructure. In the 2001 rankings of ISI Finland is 3rd, right after Sweden & Norway and slightly ahead of the United States & Denmark.

Data availability is obviously a major problem in constructing indices dealing with the new economy. Practical problems aside, what elements should be included in an index measuring competitiveness in the new economy?

Recall our 'e-competitiveness' definition from section 2: *the ability of a nation to exploit ICT to the fullest*. In what follows, our objective is to devise an indicator that gives us some idea of this ability and the ordering of countries in this dimension. Any such exercise will be somewhat superficial, but for arguments sake we give it a try.

POINTS OF DEPARTURE FOR THE E-COMPETITIVENESS INDEX

Preconditions. There are a number of *prerequisites* for a country's competitiveness in the new economy:

- Basic economic, social, and legislative stability and predictability are needed for any kind of economic development and thus also for competitiveness.
- In an ever-evolving economic environment, flexible and resilient structures are more likely to promote long-run success.
- Open, transparent, and competitive environments seem to promote more efficient outcomes in the long run.
- Technology may be disembodied (knowledge, know-how & human capabilities) or embodied (to productive assets & fixed capital). Technology is cumulative in nature: advances are based on the current stocks of knowledge. Investments in the current tangible and intangible capital stocks are likely to feed future success.
- Social aspects of competitiveness are not easily captured, but they are nevertheless of great significance. The new economy seems to progress in environments combining self-achievement with social participation. It is perhaps less elitist than prior technological revolutions have been. "Lutheran ethics" and motivation to "work hard" obviously promote competitiveness also in the new economy, but perhaps to a lesser extent than before.
- The "evil" in human nature causes us to reach less than optimal outcomes, unless incentive mechanisms are devised appropriately. Wealth & abundance tend to make us lazy.

Countries of the world differ greatly in the dimensions spanned by the above preconditions, but leading industrialized countries, the relevant reference group for Finland, are quite similar in these dimensions.

Inputs. The new economy progresses via the diffusion and use of ICT and related organizational arrangements – tangible and intangible investments to this can be seen as *inputs* to the process.

Process. By *process* we refer to economic activity that transforms these inputs into outputs. The scale, scope, and character of this process factor into e-competitiveness.

Outputs. The quantity & quality of inputs and the scale, scope & character of the process along with various features of the operating environment determine how successfully inputs are transferred into outputs. Getting desired outputs is obviously the thing that ultimately matters.

Considering preconditions, inputs, process & outputs in defining e-competitiveness appears fairly intuitive, but it is not very operational. In practice we can measure the outcome of at least one "new economy" input-process-output chain: the current level of ICT diffusion tells us what we currently have as a result of our past ICT investment. We can also capture some features of a broader "new economy" process, *i.e.*, we can get some feel for how the infrastructure is being used. Several studies have attempted to measure the overall effects of the new economy, defined, *e.g.*, as the overall productivity effects of ICT, but compatible material across countries is hard to come by.

In what follows, we will construct our own e-competitiveness index. It should be emphasized that the results are only seemingly exact, but they should nevertheless give us some idea on how Finland fares as compared to other leading countries.

THE E-COMPETITIVENESS INDEX

The following variables are included in the proposed e-competitiveness index:

Diffusion & use of ICT

- Mobile access (cellular phones, OECD, 2001c).³
- Computers (WDI, 2001).⁴
- Processing power (IMD, 2001, original source: Computer Industry Almanac Inc.).⁵
- Internet access (Internet subscribers, OECD, 2001c).⁶
- Frequency of Internet use (sessions per month, Nielsen//Netratings, 17. Jan. 2002).⁷
- Extent of Internet use (time spent online, Nielsen//Netratings, 17. Jan. 2002).⁸
- Electronic business (secure servers, OECD, 2001a).⁹
- Content provision (Web sites, OECD, 2001a).¹⁰

Provision of ICT:

- ICT employment (OECD, 2001b).¹¹
- ICT value added (OECD, 2001b).¹²
- R&D in ICT (OECD, 2001b).¹³
- ICT patents (OECD, 2001b).¹⁴

Premises – human capabilities:

- Investment in knowledge (OECD, 2001b).¹⁵
- Computer workers (OECD, 2001b).¹⁶
- Quality of IT training & education (WEF, 2001).¹⁷
- Information technology skills are readily available in the country's labor market (IMD, 2001).¹⁸

Premises – organizational capabilities:

- Suitability of the political system (IMD, 2001).¹⁹
- Overall flexibility and adaptability (IMD, 2001).²⁰
- Willingness to delegate authority (WEF, 2001).²¹
- Extent of incentive compensation (WEF, 2001).²²
- Entrepreneurial activity (Arenius, Autio, Kovalainen, & Reynolds, 2001).²³

As the selection of the above indicators show, we lay rather heavy emphasis on Internet diffusion & use (accounting for 24% of the indicators included) as well as on human & organizational capabilities (43% of the indicators). Only one telecommunications indicator (mobile access) is included, because we argue that the relevant aspects of wireline telecommunications are captured by Internet diffusion. Due to data availability, the ability of the selected indicators to capture the actual output effects is rather limited.

Descriptive statistics of the data set are presented in Table 2. The first column gives the Finnish ranking among the number of countries indicated after the backslash (/). The following four columns list, respective, the sample average, standard deviation, minimum, and maximum. Although the selection of the 47 countries included is based on the data availability, a number of indicators, especially those on ICT production, are only available for a handful of countries.

As Table 2 shows, Finland fares relatively well with respect to other countries. It shines especially in ICT provision; human & organizational capabilities are also quite good. Finland is, however, a clear laggard when it comes to the actual use of Internet. While Internet diffusion and connectivity is roughly at the average level, the number of Internet sessions and the time spent online are amongst the lowest.

Table 2: Descriptive Statistics.

	Finnish rank / Countries	Avg.	Std.	Min.	Max.
Telecom: cellular subscribers per capita	1 / 28	383,0	158,9	79,2	650,5
Computers: personal use computers per capita	10 / 47	202,2	160,7	3,3	510,5
Computers: processing power per capita	3 / 44	35067	28586	513	96588
Internet: subscribers per capita	14 / 26	116,7	69,9	13,3	231,8
Internet: sessions per month per home user	25 / 27	14,1	3,8	9,0	26,0
Internet: online time per month per home user	26 / 27	7,4	3,1	3,9	19,3
Internet: e-commerce (secure servers per cap.)	9 / 28	6,1	6,6	0,2	24,1
Internet: content provision (Web sites per cap.)	14 / 28	12,0	10,9	0,9	46,3
ICT production: share of employment	1 / 15	6,1	1,6	4,2	9,5
ICT production: share of value added	2 / 21	9,0	2,3	4,8	13,7
ICT innovation: R&D intensity	1 / 14	0,5	0,4	0,0	1,3
ICT innovation: patenting intensity	1 / 29	10,3	15,5	0,0	73,4
Premises – human capab.: inv. in knowledge	4 / 24	3,8	1,3	1,5	6,5
Premises – human capab.: computer workers	3 / 13	1,5	0,7	0,3	2,8
Premises – human capab.: quality of IT education	1 / 47	4,8	0,9	3,1	6,3
Premises – human capab.: availability of IT skills	10 / 47	6,1	1,0	4,4	8,7
Premises – org. capab.: politics well-adapted	2 / 47	4,5	1,5	1,2	7,8
Premises – org. capab.: flexibility & adaptability	7 / 47	6,6	1,0	4,3	8,9
Premises – org. capab.: willingness to delegate	3 / 47	4,4	1,0	3,1	6,4
Premises – org. capab.: perf.-based compensation	8 / 47	4,6	0,8	3,3	6,4
Premises – org. capab.: entrepreneurship	15 / 29	9,7	3,6	4,6	18,7

Sources: See text and endnotes 3–23.

In what follows, we compress the above indicators to a few measures of e-competitiveness. *First*, we create standardized values of the indicators, after which each indicator will have a mean 0 and standard deviation 1 across the available country observations. In order to reduce the effects of extreme outliers, standardized values of above (below) two (minus two) are replaced by two (minus two). The e-competitiveness measures are defined as the sums of the available standardized indicators. Besides the overall e-competitiveness index, we will consider three sub-indices:

- *Diffusion & use* include the telecom, computer & Internet indicators,
- *Provision* includes ICT production & innovation indicators, and
- *Premises* include human & organizational capability indicators.

As with the selection of the indicators, the groupings are subject to discussion.

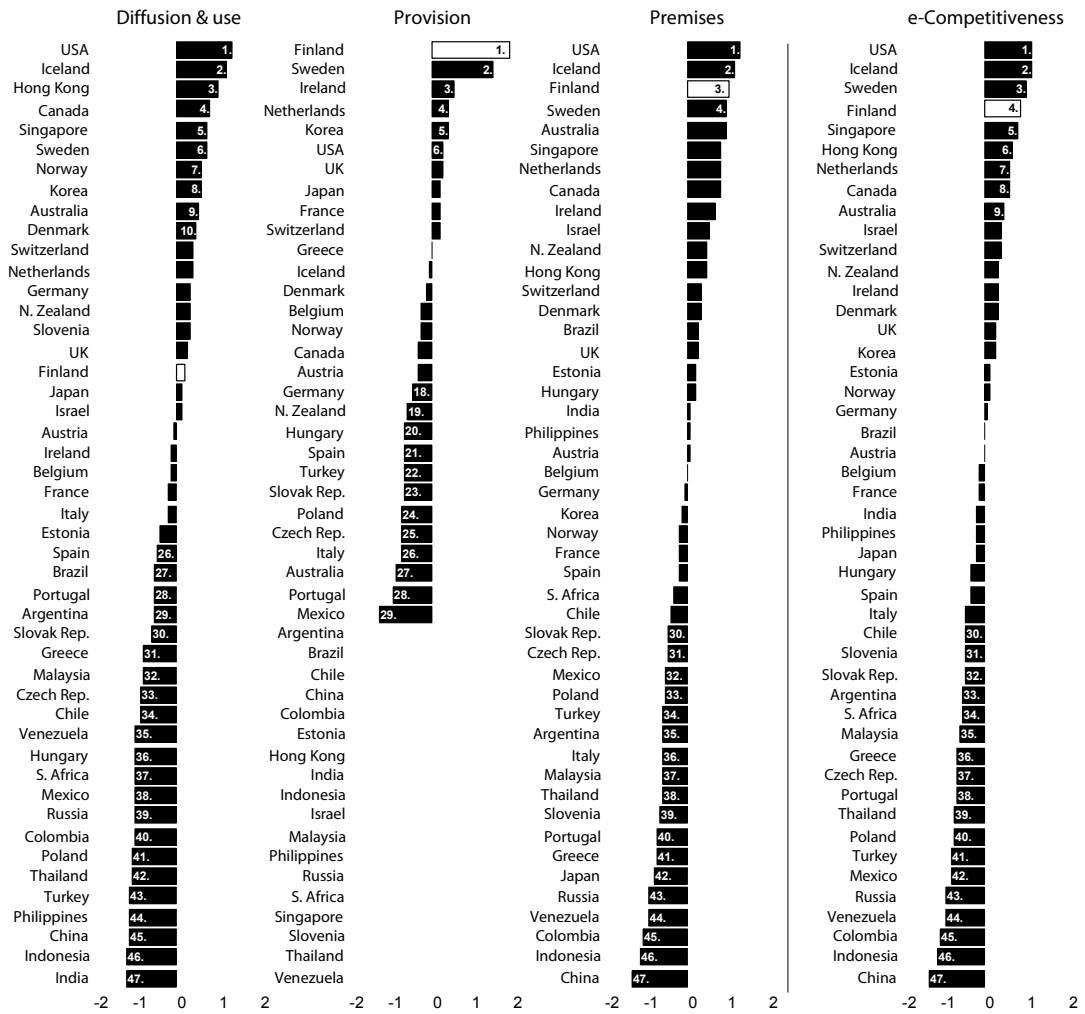
Figure 1 presents the country rankings based on the three sub-indices in the three leftmost columns and the overall e-competitiveness ranking in the far right. The indices nicely summarize what could be inferred from the descriptive statistics of Table 2.

In the *diffusion & use* sub-index Finland fares rather miserably. The country is 17th, and its index value is not considerably above the average value of zero. All the other Scandinavian countries are in the top ten. Finland is especially hurt by the rather limited Internet exploitation both at home and in business.

In the *provision* sub-index rankings Finland is on top, followed by Sweden and Ireland. The United States is only 6th and Japan 8th; the index captures the countries relative rather than absolute role in ICT provision. Other Nordic countries have negative (below average) index values.

In the *premises* sub-index Finland is 3rd, right after the United States and Iceland. Unsurprisingly Sweden is 4th. Denmark and Norway are, however, only 14th and 25th, respectively.

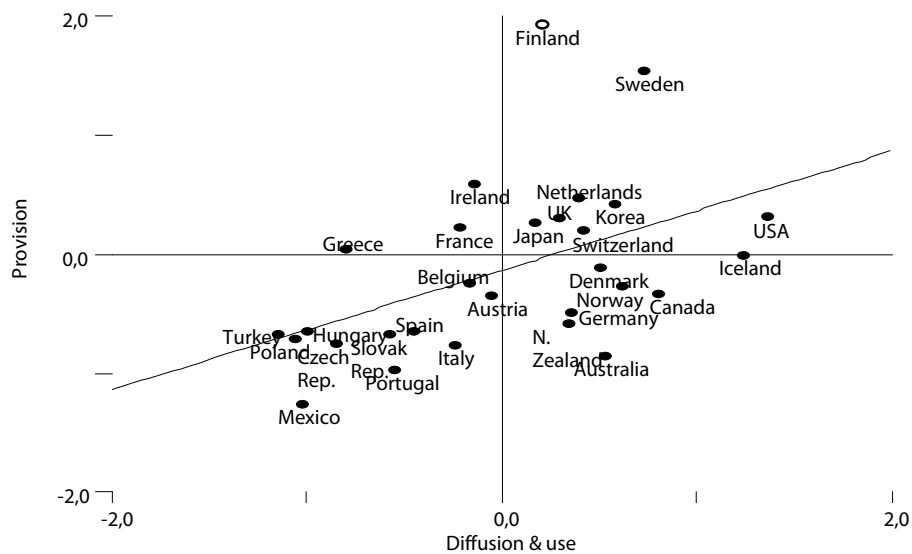
Figure 1: e-Competitiveness rankings.



The overall e-competitiveness index ranks Finland 4th, after the United States, Iceland, and Sweden. Singapore is 5th right after Finland. Denmark is 14th, and Norway is 18th.

As Figure 2 shows, there is some correlation between intensive use & provision. As the industry focus shifts from hardware to content, the relation should intensify.

Figure 2: Some correlation between the *diffusion & use* and *provision* indices.



5. CONCLUSIONS

Above we have discussed some aspects of e-competitiveness or competitiveness in the new economy, which we defined as *the ability of a nation to exploit ICT to the fullest*. The underlying idea is, that the notion of competitiveness in the emerging information society is perhaps somewhat different from the present one, although the two notions are clearly overlapping and undoubtedly converging.

By and large, nations compete over “desirability” in the eyes of private enterprises worldwide, *i.e.*, countries compete in providing an operating environment that is able to attract high value added activities of globally operating firms. This “locational competitiveness” is related to e-competitiveness: in some sense the latter is a building block of the former.

Our ability to measurement and even understand the “new economy” is rather limited. As of now, we still have only scattered evidence on the long run effects of ICT. Above we have identified some factors believed to be related to e-competitiveness.

Our measurement exercise clearly confirms what has been the “general wisdom”: *first*, Finland is highly specialized in ICT provision; *second*, the country has good premises to exploit ICT to the fullest; and *third*, it is *not* amongst the leading users of ICT.

Most surprising results of our analysis is, how far Finland indeed is from the leading countries of ICT diffusion & use. The *diffusion & use* rank of 17th among the 47 countries is not very respectable for a country once hyped as “the new economy laboratory”, or as the country where “the future is seen today”. The selection of variables, their weighting and methods are arguable, so the results are only seemingly exact but nevertheless indicative.

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ENDNOTES

¹ To be precise, this is the case for the so-called “core” economies (see Rouvinen, 2001).

² Besides the ICT indicators included in CCI & GCI, WEF also provides the following indicators as background information:

- 4.02. Public Access to Internet,
- 4.04. Quality of Competition in Telecommunication Sector,
- 4.05. High Skilled IT Job Market,
- 4.06. IT Training and Education,
- 4.10. Government On-line Services,
- 4.12. Legal Framework for ICT Development, and
- 10.18. Internet Effects on Business.

³ Cellular mobile telephone subscribers per 1,000 people, 1999.

⁴ Self-contained computers designed to be used by a single individual, per 1,000 people, 1999.

⁵ MIPS (millions of instructions per second) per 1,000 people, 1998 (4.2.08).

⁶ Internet subscribers per 1,000 people, 1999. Registered Internet accounts used during the previous three months. The information is drawn from the largest telecommunication carriers reporting both their subscribers and their estimated market shares.

⁷ July 2001. Table 1: Size of Internet Universe by Country, At-Home, Number of Internet Sessions per Month.

⁸ July 2001. Table 1: Size of Internet Universe by Country, At-Home, Time Spent Per Month.

⁹ Secure servers per 100,000 people, July 2000. Based on *Netscape's* Secure Socket Layer (SSL) surveys. *Netscape* developed SSL and it is used for encrypted transmission over TCP/IP networks. SSL provides secure end-to-end link, and its major use is to protect privileged information online.

¹⁰ *Active* Web sites per 1,000 inhabitants, July 2000. Adjusted for generic top-level domains (.com, etc.). Based on *Netscape's* survey of Web servers. Reflects the number of Internet hosts providing Web content.

¹¹ Share of ICT manuf. & services in business sector employment, 1999.

¹² Share of ICT manuf. & services in business sector value added, 1999.

¹³ R&D in ICT manuf. & services, % of GDP, 1999 (ISIC rev. 3 divisions 30, 32, 33, 64 & 72). Canada: 2000. USA: 642 instead of 64. Denmark: 1998. Ireland: 1997. Norway: 1998 (manuf.) & 1997 (services).

¹⁴ ICT patents (International Patent Classification: G06, G11 and H04) per 1,000,000 people at the European Patent Office, 1997.

¹⁵ Investment in knowledge (R&D, software, public & private spending on higher education) as a percentage of GDP, 1998. U.S. educational data includes post-secondary non-tertiary education (ISCED 4).

¹⁶ Share of computer workers (ISCO-88 classes 213 & 312) in total occupations, 1999.

¹⁷ Executive opinion survey: the country's IT training and education programs are among the best in the world (4.06).

¹⁸ Executive opinion survey: information technology skills are available in the country's labor market (4.2.12.).

¹⁹ Executive opinion survey: political system is well-adapted to today's economic challenges (2.3.12).

²⁰ Executive opinion survey: overall flexibility and adaptability is high (4.5.02).

²¹ Executive opinion survey: willingness to delegate authority to subordinates is high (10.13).

²² Executive opinion survey: compensation in your country includes substantial incentives in the form of bonuses and stock options (10.14).

²³ GEM, Global Entrepreneurship Monitor, per cent of respondents trying to start and/or run a new business (less than 42 months old), 2001.

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