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i2010 – High Level Group

Broadband Sub-Group

Broadband Performance Index in Europe

Contribution of Portugal to the ongoing discussion and weight definition

Based on contributions of Professor Pedro Ferreira

Member of the Board of Directors of the Knowledge Society Agency (UMIC)

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Index

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1. Overall goal and current framework

The broadband sub-group of the i2010 High Level Group (i2010 HLG) has been chartered in the i2010 HLG meeting of 13 May 2008, at Brdo, Eslovénia, with the challenge of developing a composite indicator of broadband performance. Such an index would allow for comparing how Member States perform in advancing Information Society at home through the effective deployment of broadband and the effective usage of ICTs.

There are serious methodological flaws involved in developing such a composite indicator. The unavoidable limitations of whatever composite indicator is adopted for broadband performance, as it becomes clear from this paper, advise, in our opinion, against adopting a composite indicator in this case. However, once this aim has been collectively established, it is our goal to contribute to the development of such an index in the most positive way ensuring, as much as possible, principles of correctness, robustness and data quality for policy making purposes.

We are here in the uncomfortable, but common in an open and shared society, position of while disagreeing with the exercise trying to contribute positively for the best possible outcome, given the circumstances, but that is life! After all compromise is a much better attitude in collective endeavours than detachment or, worse, cynicism.

2. Shortcomings of the adopted approach

2a) Gauging performance requires input-ouput measurement

The proposed index is aimed at gauging performance. The performance of any system is a relative measure of output and input. Performance is measured by how many units of output the system produces per unit of input. A system that requires less input than another system to produce the same amount of output is said to be more efficient and to exhibit higher performance. A system that produces more output than another system consuming the same amount of input is also said to be more efficient, hence more productive. Efficiency and performance frontiers can be empirically drawn from observing systems, so that other, more complex, comparisons can be drawn.

From the documents exchanged so far and from the discussions held during the meetings of the Broadband sub-group of the i2010 HLG, it is not clear to **which system the new indicator applies. Hence, the establishment of this measure of performance is not well defined**. In fact, and during such meetings, many country representatives asked repeatedly about what is in fact that one is trying to accomplish and measure and what will be the utmost goal of building up this indicator. Answers to these questions were mostly inconclusive.

The methodology suggested for developing the new indicator is based on building up a composite measure through a weighted average of supply and demand factors. However, these typically measure the size of the ICTs market and not its performance. If indeed one aims at measuring performance then one must report ratios of output factors to input factors, such as for example, GDP per capita in PPP terms, which should then appear in the denominator of the results produced. Such effect would, most likely, result in rankings across countries as those reported, for example, by the Phoenix Center for Advanced Legal and Economic Public Policy Studies, available from the Internet at http://www.phoenix-center.org/pcpp/PCPP29Final.pdf .

2b) Supply and demand factors were incorrectly identified

More importantly, and as noted in the meetings, **supply and demand factors were incorrectly identified**. Some of the indicators used so far are not supply or demand factors but rather determined by the interaction between the two, such as price. This observation led to abandon the breakdown between demand and supply factors previously suggested in the study.

2c) Looking at multidimensional world with a one-dimensional eye

A number of broadband technologies have been developed in recent times, from basic ADSL to fiber-based implementations including wireless solutions for mobility purposes. Each of these provides a service with its own characteristics targeted to specific needs and usage types. Broadband, deployment and usage, is, more than anything else, a multidimensional issue. In spite of this multidimensional character, it is a common temptation to try to summarize such development under a single indicator for communicational purposes.

While attractive, **this approach certainly hides the multidimensionality nature of broadband deployment to an undesirable extent**. In fact, summarizing all effort developed for the advancement of the information society, implemented through several complementary policy programs and projects in all member states as well as by the EC, in a single composite measure is troublesome and amplifies the adverse effects of the many problems that the several sub-indicators of the composite index already exhibit.

Moreover, Europe makes an effort to raise an informed society where people at large understand the issues and determinants of well-being, growth and quality of life, so that they can decide on a daily-basis what is best. Abridging the complexity of broadband deployment and usage into a single composite indicator might also be very misleading to

the common citizen, who needs to be aware of the diversity of means that can be used today to switch and remain on the right side of the digital divide.

As we know, both from systems theory and common experience, to charter any particular system it is essential to observe a sufficient number of independent scalar variables related to its order or dimensionality. Projecting the observation of the system in lower dimensions, although attractive from a simplification point of view, will hinder the usefulness of the observation. One may just think of what it would be like to try to navigate in common three-dimensional world with one dimensional eyes that would just give us a list of the distances to the nearest objects without any information on direction; both understanding the surroundings and navigating in space would be helpless. In the case of broadband, this shortcoming is much stronger as it is clear that **the nature of broadband deployment and use involves much more than three dimensions and, therefore, its observation with a single scalar indicator leads to even poorer results**.

A**ggregate data are not enough information to develop effective policy for the development of the information society in Member States**. Aggregate data conceal the successful experiences of member states in particular aspects and thus hinder the opportunity of showing and sharing best practices.

We believe that the best way, if not the only one, to cope with the aforementioned problems, giving what we think is the unwise decision of adopting a composite indicator for broadband, is to **report all the sub-indicators of the aggregate index every time the latter is used, together with the explanation of the methodology used to compute the composite index**. Only by reporting the data used for all the dimensions of the composite index, one can be sure to portray an accurate and useful picture of the development of broadband deployment and usage across Europe, thus avoiding misleading short sightedness and the distortions introduced by the fact that composing the aggregate index, no matter how, will always depict a unfair picture of reality.

These and other very serious shortcomings of the overall framework for developing this new indicator, which this document will address in detail, **hinder the future use of this indicator as effective and interesting information for policy making purposes**. The current document aims at pinpointing these problems offering ways to address and contain them in a timely fashion.

3. Theoretical framework for a new composite indicator on Broadband

The reach of broadband access has been traditionally assessed by coverage, namely by the number of people who have access to a broadband connection divided by total population. For this reason, broadband coverage is a very robust, well-defined and well-understood indicator of the extent to which broadband technology is available in a country to society at large. Therefore, broadband coverage should be used for the purpose of our current exercise. Referring only to coverage in rural areas portrays a limited and misleading view of how well access to broadband is disseminated and introduces additional complexity in what concerns the classification of regions as rural and urban areas. This should be avoided by **considering total broadband coverage**, **i.e. in rural areas as well as in sub-urban and in urban areas, which should all be included in this new composite indicator**.

In addition, broadband penetration, measured as the number of people who subscribe to broadband service divided by total population, provides a measure of actual usage of broadband. Therefore, it complements well broadband coverage. Nowadays, due to the importance of mobile broadband, the data on broadband penetration should be a weighted sum of fixed and mobile broadband penetrations. While broadband coverage refers only to the supply side of the market, penetration results from the interaction between supply and demand and gauges the effective usage of broadband. **Broadband penetration should thus be used in our exercise, in addition to broadband coverage**.

Significant disparities exist across Member States as to the extent of rural areas and there is no good way to solve such methodological problem. Clearly one cannot assume that Member States without rural areas perform well in this matter as this is simply a nonexistent issue for them. The truth, in these cases, is that the issue of rural coverage does not apply. For such Member States, the weight associated to this sub-indicator must revert, proportionally, to other sub-dimensions of the new composite index, which in turn creates the rather complicated methodological problem of computing the indicator for different countries with different weights. Also, differences in the classification or characteristics of rural areas in different Member States would also result in methodological problems.

A number of additional issues must be taken into account when building up a composite indicator to make sure it is soundly constructed and robust and can thus be used with confidence to guide public policy making and as well as investments in ICTs. Some of them are described below:

3a) Avoid bias from double counting

When building up a composite indicator **each effect must be measured once and only once to avoid bias due to double counting**. A composite indicator must encompass a minimal number of independent sub dimensions. Otherwise, through correlation, weights carry on from one sub-indicator to another without a clear understanding of how that happens. This misfortune tears apart the weighting system carefully designed by experts in directions one is not even aware of. Some examples that should be corrected include:

- **Do not add up competition and affordability**, because the former defines the latter. Competition is only interesting to the extent that it drives prices down and triggers innovation. But prices are already directly measured as a sub-dimension of the new indicator and innovation is effectively proxied by the take up of advanced services. Furthermore, measuring competition based on the location of local exchanges of the

incumbent equipped with DSLAMs is not a technological neutral approach, which is troublesome when we know that different technologies have different footprints (and so it is desirable in order to provide full geographical coverage). For the composite indicator, affordability is a better measure, since it is closer to the end-user. To avoid double counting and to avoid using an indicator that is poorly defined, **drop competition from the composite indicator**;

- The new composite indicator is intended to be a measure of broadband performance. To achieve such an instrument one must thus **stick to measures of broadband usage and services and avoid taking into account all other that do not relate primarily and directly to broadband**. Examples include "e-invoicing by enterprises", "e-government by individuals", "purchasing online by individuals", which are all activities that can be easily accomplished through narrowband connections, as all they do is to exchange light forms between servers and users. They are poor indicators of broadband uptake. From the measures suggested, and in good truth, **only software downloading, online games and music downloading by individuals** need broadband connections. Other activities that should be considered for this purpose include the search for health information, namely that based on images and simulation (possibly measured by traffic exchanged with health information servers), the use of P2P applications (possibly measured by number of registered users in P2P networks or by actual traffic exchanged in P2P networks), the use of the Internet for educational purposes (possibly measured by aggregated traffic in National Research and Educational Networks), for videoconferencing, IPTV and VoD (possibly measured by statistics provided by major ISPs).

- **Do not add up measures of affordability**, or prices as later discussed in the Broadband sub-group of the i2010 HLG, such as measures for the price of 512k-1M and 1M-2M offers with the median normalized offer over all possible speeds, which already uses information from the former. If prices cannot be weighted by availability then it is better to **use a measure that covers all the offers in the market**, which avoids both

double counting and having to change the speed brackets considered in the near future. While the 512k-1M and 1M-2M brackets might be interesting current targets for policy making, these will certainly change soon and so will the new indicator without a clear understanding of which brackets should be used for our purpose at each point in time. Furthermore, introducing the inverse of the median of "price/speed" **introduces an intolerable non-linearity on how this indicator is computed that must be avoided**. We suggest computing the median bandwidth (and not price) used by all subscribers to broadband and divide it by the lowest prices of the offers considered that cover at least 50% of the market. This would result in an indicator of the median bandwidth purchased per Euro, thus robust and comparable across countries.

3b) Measuring the right thing

One needs to be sure that one measures and includes in the composite indicator the real important determinants of broadband deployment, usage and performance. Thus, extra care must be placed in the following cases:

- If one does want to introduce a measure competition, either provider competition of platform competition, the best way to do so without information on costs, is to **use an Herfindhal index on the market shares of the main broadband providers or of the mostly used broadband access technology** (at least wireless, cable, DSL and fiber). This could be achieved by summing up the squares of the market shares of these technologies over the whole territory, which is information easily obtainable from providers. Therefore, consider changing competition to be measured in this way. If data are not available to carry on such an exercise, then **consider dropping competition at all**, since we cannot afford to introduce into this new composite indicator measures that we know from the outset that are deceit.

- Indexes that measure the usage of electronic services **must be independent of the interfaces used**. The fact that the citizens (and companies) can increasingly perform a number of activities (e.g. banking and shopping) from a number of different interfaces, such as personal computers, PDAs or ATM machines, must be accounted for by an index that measures the up-take of such services over broadband networks. While data might not be available for such a vast number of interfaces, one must acknowledge this trend and provide **ways to measure effectively the use of high-speed communication networks through a ever growing number of different devices**. The most notable case of this need is the spur of **wireless broadband communications** that need to be included in this new indicator, as described further below in this document.

3c) Broadband connections are not all alike

Effective broadband available to end-users is a result of the interaction of many variables, some of them of technical nature, that are not trivial to gauge and often unrelated to the speeds marketed by providers. Therefore, additional care must be used to **acknowledge that not all connections are the same despite the sensational offers presented by most providers**. For a reference broadband offers of more than 2 Mbps over copper lines are suspicious.

The effective broadband available to consumers depends on the quality of the access line (e.g. distance to central office in the case of ADSL), on the efficiency of the terminal active equipment (e.g. capacity of the set-top box in the case of cable), on the **contention ratio in the local loop** and on downtimes. A reasonable measure of available broadband that can be compared across countries can only be obtained by compounding all the factors that influence the quality of the connection used. Besides, this information is of essential value for consumer protection.

While this information is not collected on a regular basis, it is important that the current exercise of coming up with a new broadband performance index **raises the need for new and better measures related to the broadband phenomenon and to quality of service in particular**, where quality of service must be understood as the actual delivery, by ISPs, of network connections that meet the characteristics contracted by end users through Service Level Agreements (SLAs), such as maximum end-to-end delay and maximum downtime experienced Otherwise, the new indicator will reduce to combining existing measures through a weighting system for ranking purposes, which will be certainly a less attractive endeavor.

The indicator considered for quality in the new composite indicator is in fact an indicator of speed. It has been suggested to add average speed to % of subscribers to products with more than 2 Mbps. Thus, and first, **change the name of this sub-dimension to speed and not quality** to avoid misunderstandings. Next, do not add up these two measures to avoid problems already identified before in this document, namely double counting and attaching more weight to the 2 Mbps speed bracket which we know is a moving policy target. **Consider using only average speed**.

Finally, and if there is not enough data to allow for weighting coverage with quality, which would be the ideal way to address the issue of "average speed", consider a **high enough weight on the (quality) speed factor to reflect the importance of high-speed connections as the way markets should move forward in the near future**.

4. Forward looking approach: the case of wireless Broadband

The indicators used to measure broadband deployment and usage are 8 years old. However, ICTs have been changing at an accelerated pace. There is little doubt about the turbulent dynamics of the ICTs sector, which cannot be captured by measuring old indicators. Such a practice results in awkward situations like conceiving that connections above 144 kbps are broadband, a reference completely outdated by all accounts.

Overall, 8 years is too long a time to acknowledge changes in the ICTs sector, especially when the EC's i2010 already acknowledges a number of recent developments as key for the advancement of the information society in Europe, such as **e-inclusion, e-health, e-science, e-learning, e-commerce, infotainment, ambient intelligence,** which are all delivered through broadband and thus one could only expect them to make up for a composite index of effective broadband usability.

But far more important is the fact that **wireless broadband must be factored into as indicator whose major objective is to exactly measure the extent of deployment and usage of broadband**. Wireless broadband was not at all here 8 years ago, but it is now **indisputable that it is used to a significant extent as a broadband access technology** and it has even substituted fixed broadband in many occasions. Countries across Europe report high usage levels of wireless broadband.

Wireless broadband is both a substitute and a complement for fixed broadband. Either way one can **no longer afford to neglect its role in the development of the information society, especially also because wireless broadband is the primary means to offer mobility services that are increasingly used and required by citizens at large**. The inclusion of wireless broadband is thus the right step towards making sure that a new indicator on broadband deployment and usage in Europe includes what really matters in a forward looking fashion.

As noted in many instances, most notably in the last TTE Council, **mobile broadband penetration must be accounted for in all exercises targeted at measuring broadband in the EU context**. Ways to measure mobile broadband penetration have been discussed, as for example at the OECD level. In our opinion, the new broadband performance index needs to account for mobile broadband penetration from the outset, as a way to measure the effective usage of mobile broadband as well as a means to provide a signal that one cannot afford to fail to meet the requirements of citizens in terms of mobility. A specific weight to wireless broadband must be considered and Member States that do not provide (or do not report) mobile broadband access must remain at zero, to show exactly that

they lag behind in terms of addressing this important dimension of the development of the Information Society.

5. Quality of the data used for all sub-indicators

Any indicator is only good to the extent that the data collected to report it are trustful. The data used to **fill in each sub-indicator must be carefully obtained**. All effort to define the appropriate theoretical framework for the new indicator can be totally jumbled if data are poorly collected by samples, opinions and other less rigorous methods that substitute for objective measurement.

For example, in 2006, usage of ICTs in classrooms was obtained by inquiry to so called school principals. A mere 73% penetration was obtained for Portugal. Objective data from inbound and outbound traffic rates from PCs connected to the Internet in schools allow us, in Portugal, to safely say that such a measure is downward biased by at least 23%, which is an intolerable gap. These cases repeat themselves at an undesirable pace. For example, more recently, the Special Eurobarometer 293 of the European Commission on the "E-Communications Household Survey" reports that, in the winter 2007, 39% of households in Portugal had at least one PC, 29% of them access the Internet and that 22% of them do so over broadband. However, EUROSTAT reports in their website that in 2007 these figures were, for the case of Portugal, 48%, 40% and 30%, respectively, values that could only have increased from the 1st quarter of 2007 to the 4th quarter when the survey reported by the Eurobarometer was held. Again, the gaps observed in these statistics are intolerable. Although we did not check the data reported for other member states, we suppose this kind of inaccuracies also happen for several of them. As such, commissioned surveys such as those mentioned above should never be used as sources of reliable data.

It should be noted that **every Member State has procedures in place handled by the official institutions to measure most of the variables needed to develop a composite index for broadband. Those should be the data used for developing the new broadband**

performance indicator. Other data, sometimes from international studies, should be disregarded if their quality does not comply with reasonable standards, despite the fact that they might be readily available.

6. Designing the weighting system

A central part of the development of any composite indicator is the associated weighting system. A number of issues must be carefully examined to do so.

6a) Enablers vs. actual broadband usage

The new composite indicator is a measure of broadband performance, which is directly assessed by considering measures such as broadband coverage and the quality of broadband connections. Other measures, such as those included in the "socio-economic context", act as enablers for broadband usage and performance. However their inclusion introduces not only double counting but also dimensions that are only marginally related to broadband and that are more appropriate to gauge economic and social performance. This problem is acute to the extent that large weights are attached to such variables. For these reasons, **small weights must be attached to socio-economic variables**.

In addition, one must restrict this exercise to variables that are truly associated to broadband deployment, usage and performance. The following variables are not so:

- "e-Skills" is a sub-measure of educational attainment considered in other statistics, namely those related to education and qualification. e-skills are not particularly related to broadband. e-skills are here measured by % of individuals with basic internet skills, but basic internet skills seldom require the usage of broadband connections. For this reason, **e-skills should not be used in this exercise**;
- Expenditure on ICTs in general terms goes well beyond broadband related equipment and services to include expenditure that is not directly related to investment in broadband (e.g. massive expenditures on ICTs for defense and war purposes, on the software industry, on hardware and electronic devices, etc...). For this reason, it does

not capture what is needed for the purpose of this exercise. Thus, **ICT expenditure should not be included in this exercise**;

In good truth, only the penetration of 3G devices can be strongly related to broadband, given that connecting over broadband is the only feature that distinguishes 3G devices from other mobile devices. To a lesser extent "Household PC penetration" can be also used as a proxy for broadband usage given that PCs also allow for connecting to the Internet through broadband, though PCs are not always used for such purpose and are frequently used to accomplish a number of tasks that do not require any type of Internet connection at all.

6b) Identifying the major determinants of broadband development – Expert elicitation

The weighting system identifies the determinants of broadband development in Europe because it will indicate which dimensions of the analysis are more important. This is thus an operation that must be carefully developed. **Choosing the same weights for all sub-measures is no more than a starting point**, but meaningless as long as there are no good reasons to believe that all sub-measures are equally important. However, providing such a starting point develops an undesirable anchoring effect across Member States because it is much easier to agree with a pre-defined weighting grid than going through the tough exercise of finding the right weights.

The only way to choose the appropriate weights for an exercise like this is to **elicit them from experts in the field that are fully aware of how the Information Society develops worldwide and how broadband can become a major trust for such development**. Eliciting weights from experts is a consensual practice in many academic fields to produce studies where one needs to balance complementing, and sometime countervailing, factors. In our case, experts must be aware of the diversity of scenarios for broadband deployment and usage in Europe, which can only be ensured if all Member States are represented in the expert group by people that are highly engaged with the development of the Information Society in their home countries and, therefore, in Europe as a whole.

We are satisfied for the Commission having agreed to follow this sounder process, which now must **converge to a final weighting system that must be discussed and approved by all Member States** in the appropriate forum.

6c) Substutability across factors

A composite index assumes substutability across its sub-factors. Two factors with weights "w" and "v" have a marginal rate of substutability of "w/v". For example, if affordability has a weight of 0.2 and competition a weight of 0.4 then having twice as much affordability is as good as having competition. But, and as we know well, **input factors for the Information Society are seldom substitutable**. The previous example offers already a first case, having much competition is no use if affordability does not increase. Other examples are even more striking. Having 4 connections of 0.5 Mbps is not as good as having 1 connection of 2 Mbps. While the latter can be used to download video on demand the former can hardly provide even video streaming. Having 2 PCs at home is not as good as (or at least not the same as) having 1 PC with 1 Internet connection, but a composite indicator with the wrong weights might entail just that.

Any weighting system entails substutability across factors. Choosing a weighting system for the new composite broadband performance index will result in certain substutability ratios. **Consider choosing weights by asking if the resulting substutability across factors makes sense. Such a practice is widely used in other weighting systems and proves to be a quite useful tool.**

6d) Robustness of the outcome

The composite indicator, computed as the result of applying the weights to the selected sub-measures, will result in a ranking of Member States. **This ranking should be robust to the choice of the weights**.

Consider that two sub-measures of the composite indicator are given weights 40% and 60% and that results in some final ranking. Change the weights of these measures to 38% and 62%, or to 43% and 57%. If such a small change in the weights results in (significant)

changes in the resulting ranking, then weights are poorly chosen and become meaningless. Attaching a weight of 38%, 40% or 43% to a specific sub-measure is very much the same from a qualitative perspective, and no expert can probably make a case why the weight should be 38% and not 43%. But if the resulting ranking of Member States changes as a consequence of such a small change in the weights, then further analysis needs to be developed. **Consider reporting sensitivity analysis of the weighting system chosen as to assess its robustness.**

7. Defining the weights

Taking into account all the issues discussed in this document, a sensible set of weights for computing the BPI from the component indicators proposed with the Commission in the expert group is provided below[1] (refer to the Annex for the weights proposed by the Commission and the expert group by average of survey results):

1st DIMENSION: Broadband rural coverage

Weight: 22.0

Justification: Broadband coverage is the most robust and well-understood indicator of broadband. It should be used for the purpose of this exercise, but with the following changes. Referring only to rural areas introduces additional complexity that should be avoided by considering total broadband penetration, i.e., both in rural areas as well as in sub-urban and urban areas. Significant disparities exist across Member States as to the extent of definition and characteristics of rural areas and there is no good way to solve such methodological problem. Clearly one cannot assume that Member States without

[1] Again we adopt a positive pragmatism contributing with our best suggestion, though disagreeing with the overall exercise of adopting a single composite indicator for broadband, and with some of the chosen component indicators.

rural areas perform well in this matter as it is nonexistent for them. The truth, in these cases, is that the issue of rural coverage does not apply. For such Member States, the weight associated to this sub-indicator must revert, proportionally, to other sub-dimensions, which in turn creates a rather complicated methodological problem of computing the indicator for different countries with different weights. Also, differences in the classification or characteristics of rural areas in different Member States would also result in methodological problems.

Besides coverage, **we consider absolutely necessary to include the single most important indicator used for broadband up to now, namely penetration**. Ideally, it should be penetration in households, but if that is found problematic the more robust and easy to obtain broadband penetration in the population could be used. It is unreasonable not to include the most traditional indicator of broadband, which is broadband penetration.

In addition, **one must include mobile broadband penetration**. As largely discussed in the experts group, mobile broadband is a major trust of today's broadband development and in many countries a significant means of access. As noted in many instances, most notably in the last TTE Council, mobile broadband penetration must be used very soon to account for broadband indicators in the EU. Ways to measure its penetration have been discussed, most notably at the OECD level. In our opinion, the new broadband index needs to account for mobile broadband right from the outset. In this regard we propose that this indicator, total broadband penetration, should be further divided into fixed and mobile penetration, with equal weighting (50% each).

2nd DIMENSION: Broadband competition

Weight: 17.0

Justification: This indicator is poorly defined. Competition is interesting to the extent that it drives prices down and triggers innovation. But prices are already measured directly as a sub-dimension of the new indicator and innovation is proxied by the take up of new

advanced services. A low weight must be associated to competition to trim down the effect of double counting. In addition, measuring “competition” based on the location of local exchanges equipped with DSLAMs is not a technological neutral approach, which is troublesome when we know that different technologies have different footprints (and that is desirable in order to provide full geographical coverage). This is not at all the most appropriate way to attach importance to the benefits of platform competition.

3rd DIMENSION: BB price

Weight: 17.0

Justification: The theoretical definition of this sub-indicator is rather poor. From the three categories suggested only one can be used to avoid double counting. “Speed/Price” should be the one used. The others favour one speed bracket over all the others and thus the new indicator would need to be revised rather soon to avoid becoming yet another outdated broadband indicator. Furthermore, using the inverse of the median introduces a intolerable non-linearity in the way this indicator is computed that must be avoided. We suggest computing the median bandwidth used by all subscribers to broadband and divide it by the lowest price of the offers considered that cover at least 50% of the market. This would result in an indicator of the median bandwidth purchased per euro, thus comparable across member states.

3.1 Weight for indicator "Price/Speed": 70

Justification: (see text above)

3.2 Weight for indicator "Price 1-2 Mb/s basket": 20

Justification: (see text above)

3.3 Weight for indicator "Price 512-1 Mb/s basket": 10

Justification: (see text above)

4th DIMENSION: Quality

Weight: 22.0

Justification: The indicator proposed is not about quality but rather speed. The name should be changed to speed to avoid misunderstanding. This is even more relevant as Quality of Service should be and is not assessed. Devising true measures of quality of service (such as delay, jitter, uptime, contention) should be considered in order to cope with the lack of robust information on quality across Europe, but we should be aware about the lack of reliable and comparable data on Quality. This sort of indicator is important to the extent that they refer to speed and that quality of broadband connections.

4.1 Weight for indicator "Average Speed": 75

Justification: Average speed uses information about all offers subscribed in the market and does not favour one speed bracket over another. It should be the average of actually subscribed speeds weighted by the numbers of respective subscribers. Between the two options suggested, this is the most appropriate one to use.

4.2 Weight for indicator "% of subscribers to products with speeds above 2 Mbs": 25

Justification: The percentage of subscribers to products with speeds above 2 Mbps is not a good indicator of quality, or speed. It favours the 2 Mbps threshold, which is a target that will certainly change over the years. Furthermore, speed indicators are very unreliable because they refer to advertised speeds and not actual speeds that customer’s experience. True speeds are significantly lower than those

advertised, mostly due to contention effects, and it is misleading to take for granted that offers of 2 Mbps are indeed so.

5th DIMENSION: Take-up of advanced services

Weight: 11

Justification: In general, and as noted in the justifications below, most of the indicators considered in this exercise have little to do with broadband. While they refer to relevant matters for the overall development of the Information Society, of varied importance, they do not reflect specifically issues related to broadband and therefore their weight must be adjusted accordingly.

Instead, and to correctly reflect the need and use of broadband in the take up of advanced services one should consider activities such as the search for health information, the use of P2P applications, the use of the Internet for educational purposes and videoconferencing. If such indicators have been considered their weights should become:

Software downloading by individuals: 10; Online games and music by individuals: 5; Search of health information: 35; Use of P2P applications: 15; Use of the Internet for educational purposes: 25; Use of the Internet for videoconferencing: 10.

5.1 Weight for indicator "e-Invoicing by enterprises": 0

Justification: e-invoicing does not require a broadband connection. Invoicing refers simply to the exchange of a light document, text-based, with the relevant information about a purchase, which does not require broadband capacity to be transmitted. Dial up is enough and therefore this indicator should not be used for broadband.

5.2 Weight for indicator "e-Government by enterprises": 100

Justification: e-government by enterprises is the only sub-indicator suggested here that can be related to broadband. Though most of the e-government activities that companies perform today are light text-based, and therefore do notr rely on broadband, some examples of information-intensive activities emerge, such as public procurement, especially when this needs to include maps, images and video. Of the three indicators proposed in this dimension this is the only one that, albeit to a small extent, may have something to do with broadband.

5.3 Weight for indicator "e-Government by individuals": 0

Justification: e-government by individuals includes activities related to income taxes, job searches, social security benefits, personal documents (e.g. passports and driver's licence), car registration, declarations to police, certificates and enrolment in higher-education. None of these require a broadband connection. As such, this indicator is not relevant for measuring broadband-related issues.

5.4 Weight for indicator "Software downloading by individuals": 90

Justification: Software downloading is an activity that indeed requires a broadband connection and that will increasingly need one. Software packages, even the simplest ones, are ever larger and heavier and thus this is a good forward-looking indicator to introduce in the broadband performance index.

5.5 Weight for indicator "Online games and music by individuals": 10

Justification: Online gaming and music downloading is another activity that requires a broadband connection and thus it should be included in this index, although software downloading is much more information-intensive. In any case,

these are the only two sub-dimensions here considered that are in fact related to broadband.

5.6 Weight for indicator "Purchasing online by individuals": 0

Justification: Purchasing online as it is measured today does not require a broadband connection. Purchasing online requires only the exchange of simple text-based formularies, which are not at all information-intensive. Purchasing online is not related or a proxy for broadband usage.

5.7 Weight for indicator "e-banking by individuals": 100

Justification: e-banking by individuals does not require a broadband connection. In fact, a significant share of e-banking is not even done over the Internet (or IP) but rather using alternative communication networks, like ATMs. Still, e-banking by individuals is better than purchasing online by individuals as proxy for trust.

6th DIMENSION: Socio-economic context

Weight: 11

Justification: The variables included in the socio-economic context act simply as enablers for broadband usage and performance. But broadband usage and performance is already measured by all the other sub-dimensions of this new composite indicator. Including social-economic context variables introduces not only double-counting but also other variables that are only marginally related to broadband, as noted below.

6.1 Weight for indicator "e-Skills": 15

Justification: e-skills is a sub-measure of educational attainment considered in other statistics, namely those related to education and qualification. More importantly, e-skills are not particularly related to broadband. In this context, e-skills are measured by % of individuals with basic internet skills. Basic internet skills seldom require the usage of broadband connections.

6.2 Weight for indicator "Household PC penetration": 15

Justification: PCs are enablers for a number of different activities, most of them not at all related to or need a broadband connection or Internet at all. For that reason, household PC penetration is a poor proxy for broadband usage.

6.3 Weight for indicator "3G penetration": 55

Justification: Contrary to households PC penetration, the purpose of a 3G handset is exactly to have a mobile broadband connection. Although one might not use it, this is the only distinguishing feature of such as device. This is the only sub-indicator in the socio-economic context that is, in fact, related to broadband.

6.4 Weight for indicator "ICT expenditure": 15

Justification: Expenditure on ICTs in general terms goes well beyond broadband related equipment and services to include expenditure that is not at all related to broadband (e.g. massive expenditure on the software industry, hardware, electronic devices, etc.). For this reason, it does not capture what is needed for the purpose of this indicator.

ANNEX: Component indicators and weights proposed by the Commission and average of survey of Broadband Sub-group members (experts)

DIMENSIONS	EC proposal	Experts' proposal	Difference
BB Rural Coverage	0.5	0.68	0.18
Market share of new entrants (NON-DSL + LLU + OWN PSTN) * nation. coverage	1.0	0.92	-0.08
Price	1.0	0.88	-0.12
Quality	1.0	0.99	-0.01
Take-up of advanced services	1.0	1.08	0.08
Socio-economic context	1.0	0.95	-0.05

Dimensions	Indicators	EC proposal	Experts' proposal	Diff.
BB Rural Coverage		0.50	0.68	0.18
Market share of new entrants (NON-DSL + LLU + OWN PSTN) * nation. coverage		1.00	0.92	-0.08
Price	Median of price/speed	0.50	0.48	-0.02
	BB Price. Median offer. Basket 1 Mb/s -2 Mb/s	0.25	0.21	-0.04
	BB price. Median offer. Basket 512 Kb/s -1 Mb/s	0.25	0.19	-0.06
Quality	Average speed	0.50	0.54	0.04
	% of subscribers to products with speeds above 2 Mb/s	0.50	0.46	-0.04
	e-Invoicing by enterprises	0.167	0.173	0.01
Take-up of advanced services	e-Government by enterprises	0.167	0.190	0.02
	e-Government by households	0.111	0.124	0.01
	Software downloading by individuals	0.111	0.121	0.01
	Online games and music by individuals	0.111	0.113	0.00
	Purchasing online by individuals	0.167	0.187	0.02
	e-banking by individuals	0.167	0.173	0.01
Socio-economic context	Percentage of individuals who have carried out 1 or 2 of the Internet related activities	0.50	0.306	-0.19
	Household PC penetration	0.125	0.203	0.08
	Penetration of 3G handsets	0.125	0.164	0.04
	ICT expenditure	0.25	0.282	0.03