A Cost-Benefit Analysis Framework for assessing the net benefits of Digital Business Ecosystems implementation in Europe

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Introduction

Knowledge is central for economic development (World Bank, 1998). The movement of ideas within a country or a region and the capacity on which knowledge can produce positive impacts on economic development depends on the effectiveness of its knowledge communication system. The Digital Business Ecosystems (DBE) has the capacity to provide every business entity in Europe with a powerful opportunity to efficiently use knowledge. The ability to be connected and to share and acquire knowledge is a contributor to reduce the information gaps and to lower power asymmetries between Large Enterprises (LEs) and Small and Medium Enterprises (SMEs). DBE infrastructure can be conceived as a corrective action to solve the lack of access to information among enterprises. Business connectivity allow SMEs to increase their opportunities to integrate themselves into global value chains and provide them with more upgrading opportunities that create further positive impacts on regional development.

DBE implementation has the potentiality to produce positive effects on productivity as knowledge (access and dissemination) enhances the productivity of capital (Stiglitz, 1999)\(^1\). It also has a potential in inducing regional development through competitiveness enhancement among business. New growth theories consider that the more resources devoted to technical progress (activities that produce innovations), the higher the growth rates (De Castro, 1998). DBE has the potentiality to endogenously impact production, as productivity increases are endogenous to production (Cooke et.al., 2005). Investing in DBE implementation is a long-term investment in knowledge creation and dissemination.

Although the scientific research on the potentialities of DBE has been extensively developing over the last years, there is still a lack of awareness among policymakers and general public on the socioeconomic impacts of DBE implementation. This paper explores these potentialities while proposing a Multiple-Account Cost-Benefit Analysis (CBA) framework to assess them.

This study has two main objectives:
(1) to provide an efficiency analysis of the existing pilot projects
(2) to promote among policymakers the benefits of DBE implementation.

CBA is a systematic framework to analyse the efficiency of projects, programmes, policies or regulations (Munford et.al., 2000). We believe that by giving monetary values to benefits and costs of DBE implementation we will be able to provide policymakers with valuable information to encourage them to implement DBE in their regions.

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\(^1\) It allows access to information and knowledge through business connectivity.
Four different accounts are proposed for the CBA for DBE implementation: financial, user/consumer, economic development and social.

The first two accounts (financial and user/consumer accounts) present the actual data of two selected regions that have implemented DBE pilot projects: the region of Aragon in Spain and West Midlands in the United Kingdom (UK). The economic development and social accounts are presented in the form of guidelines, as they are region-specific\(^2\). The main indicators that should be analyzed by any interested region on DBE are presented. Because current pilot projects are still at an early stage of development we cannot provide concrete impacts on these accounts. Economic theory will provide us with the bases of the likely impacts of DBE implementation.

1. **An ideal business structure for DBE development**

DBE can be used by every business entity in Europe, irrespective of the size of the concerned enterprise and its sector of activity. According to the Industry, Trade and Services Statistics of Eurostat (2006)\(^3\) there are more than 17 million SMEs in the European Union 25 (EU-25). SMEs have a main role in the business structure of Europe. In 2003, 99.8% of total enterprises in EU-25 non-financial business economy were SMEs. Micro enterprises are predominant, representing the 91.4% of total enterprises, followed by small enterprises with 7.3% of total and medium enterprises with 1.1%. Large Enterprises (LEs) are only 0.2% of the total\(^4\). As DBE is especially oriented to support SMEs connectivity\(^5\) it is necessary to study European business characteristics focusing on SMEs.

More than 65% of all SMEs in EU-25 are concentrated in 5 countries: Italy (22% of total), Spain (14%), France (13%), Germany (10%) and the United Kingdom (9%). Italy and Spain together have more SMEs than 20 other countries in the EU-25. In average, in 2003 there were 38 SMEs per 1,000 population in the EU-25. Countries above this average are Italy, Spain, the Czech Republic, Portugal, Hungary, Slovenia, Cyprus and Luxembourg. Some of these countries are different from the countries that concentrate most of SMEs mentioned above, indicating that the industrial structure of a country is determinant for SME proliferation. We expect that DBE implementation will be largely beneficial for countries whose sectors and economic structure are dominated by small firms.

Data from the Observatory of European SMEs\(^6\) shows that the countries with the largest concentration of SMEs have seen their number of SMEs decrease considerably over the last 10 years, evidencing a large SME mortality rate. DBE also would help SMEs to reduce their vulnerability by creating networks among them.

\(^2\) 'Region-specific' in the sense that the social context and the economic (and institutional framework) setting vary from region to region
\(^3\) Although otherwise stated, all the indicators presented in this section are built from data of the Industry, Trade and Services Statistics of Eurostat. Raw statistical data can be found on the Eurostat website.
\(^4\) A micro enterprise is an enterprise that has 1 to 9 employees. Small enterprises have between 10 and 49 employees. Medium enterprises employ between 50 and 249 persons and large enterprises employ more than 250 persons.
\(^5\) SMEs could be connected with other SMEs but also with large enterprises around Europe.
\(^6\) This data is taken from the CD-ROM of the Observatory of European SMEs. It gathers data from SME statistics from Eurostat and from the ENSR Enterprise Surveys. The online version is accessible at: [http://www.eim.nl/Observatory_Seven_and_Eight/start.htm](http://www.eim.nl/Observatory_Seven_and_Eight/start.htm)
European SMEs serve a variety of different sectors. They are mainly concentrated in two sectors: services and trade. Service SMEs are mainly located in Germany, the UK and Italy, while trade SMEs are dominant in Italy, Germany and Spain. Manufacturing industry SMEs are less important in number but are very relevant in terms of value added and employment. Manufacturing industry SMEs are mainly located in Italy, the UK and Germany. Construction SMEs are mainly located in the United Kingdom, while most of the wholesale and retail trade SMEs are located in Italy. Hotels and catering SMEs are widely present in France, Italy and Spain; while the majority of business services SMEs are located in Italy, Germany and the United Kingdom. On analyzing the economic impact of DBE implementation it is important to understand that different outputs can be expected according to the "weighted importance" that the concerned sector has on the regional economy. It is necessary to underline that expected outcomes are region-specific, but they could be also sector specific according to the deployment strategy and the approach to DBE adopted by each region.

An important facilitator for DBE implementation is SME's engagement in e-business. The European Commission E-business survey 2006 shows that there are big differentials in the use of e-business applications between large enterprises and SMEs (EC, 2006). The overall e-business Index (based on firm-weighted data) in 2006 reveals that there are approximately 50 SMEs engaged in e-business for every 100 LEs. The European Commission (2005) underlines that ICT and e-business offer SMEs an improved access to market information at low cost. Nevertheless, as fixed costs for technology implementation tend to be relatively higher for small companies, there is still a weak use of internal applications and supply-side e-business activities among SMEs.

In contrast, there are no differences between small and large enterprises when receiving orders from customers online. The sectors connecting and receiving orders from customers online more frequently for small enterprises are tourism, Telecommunications and the Pulp and Paper sector. This reveals that connectivity with customers and cooperation networks with other SMEs is crucial for them while competing in the marketplace. Nevertheless, there is a gap between the percentage of SMEs receiving at least some orders online (26%) and those that have special software for doing so (11%). This confirms that SMEs use rather "simple" forms of e-commerce: receiving orders by e-mail without any system integration of the related information and document flow.

Benchmarking ICT adoption and e-business by country is a complex exercise, since results could reflect other factors such as the industrial structure. However, Nordic countries are in

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7 Activities performed by service SMEs are: Hotels and catering; transport and communications; banking, finance or insurance; business services and other service industries.  
8 Trade SMEs include wholesale trade and retail trade SMEs.  
9 Manufacturing industry SMEs located in Italy produced the largest value added in the EU in 2000 (European Communities, 2003). DBE implementation in this industry could create large impacts on Italian economy.  
10 See Shelton (2006) and section 3.  
11 The e-business Index is drawn under a Balanced Scoreboard approach. It consists of 16 component indicators which are aggregated into 4 sub-indices that represent major application areas of e-business: Access to ICT networks, e-process integration, Supply-side activity, and Marketing and sales. The four sub-indices can be aggregated into an overall e-Business Index.  
12 Firm-weighted data expresses e-business adoption as “% of firms within a size-band with a certain activity”.  
13 26% of both, small and large enterprises receive orders from customers online.
general the most active users of e-business among SMEs. Differences are not pronounced and not clear among countries like France, Germany, Italy, Spain and the UK.

The results of the benchmarking suggest a pronounced digital divide between small and large firms. For example, in Italy, sectors dominated by small firms are much more prevalent than in other countries. This structure is reflected in the score of Italy in the benchmark. The DBE, as a ‘non-traditional’ application of ICT for business, could help the sectors (and SMEs) of these countries to overcome the digital divide.

The Digital Ecosystem has a big potentiality in helping SMEs to connect with potential customers both in Business-to-Business (B2B) transactions and in Business-to-Customers (B2C) transactions. In average, only about 11% of SMEs use software solutions or internet-based services for e-procurement. There is also a massive gap between the percentage of SMEs placing at least some orders online (53%) and those that use special software for this (11%). Companies without a special software place orders mainly through websites or extranets of suppliers, revealing that the digital back-office integration of procurement related processes is not advanced in these cases.

2. Cost-Benefit Analysis and Digital Business Ecosystems: a Multiple-Account Analysis

Decision-makers at the regional level are most of the time devoted to the economic development of their region, and are interested in those projects whose implementation produce society gains. Economic efficiency is at the core of CBA. Its aim is to address the question on what the net balance would be between economic and social benefits of projects implementation (Shaffer et.al., 2003). It gives monetary values to benefits and costs in order to express the aggregate change in individual well-being from policies or projects (Munford et.al., 2000). In this effort, we are interested in measuring incremental benefits and costs (our baseline will be 'no-adoption' of DBE). In CBA, economists value benefits and costs by comparing 'willingness to pay' (WTP) to 'opportunity costs' (OC). WTP is defined as the maximum amount SMEs or large enterprises (DBE's users/consumers) are prepared to pay for DBE implementation. OC are the costs to the region of implementing DBE instead of implementing any other project (the next best alternative that is foregone whenever a decision-maker decides to adopt DBE). It would be also really useful for some regions, policymakers and users to analyse WTP and OC using the baseline 'DBE adoption'. In this case, OC are the costs to the region/policymakers/users of implementing any other project instead of implementing DBE. In both cases, the aim is to analyse what are the net benefits of DBE implementation and/or what are the net costs of no implementing DBE.

A Multiple Account CBA is proposed. Four evaluation accounts are being designed to provide an overall assessment (Shaffer et.al., 2003). The use of different accounts is done in order to present a clear description on what the consequences and trade-offs from DBE implementation will be. This methodology recognizes that it is very difficult to assign a Euro-value to all different impacts and to aggregate them into a measure of net benefits

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14 I would like to thank Dr Marvin Shaffer, former Senior Lecturer at the University of British Columbia in Canada that provided me with general guidance in developing the methodology for the CBA framework on DBE implementation.

15 This difficulty has been specially recognized by the research team, the project managers of pilot projects and the current users.
The lack of any precedent on DBE implementation (apart from the pilot projects) makes us recognize the uncertainty of the outcomes. A wide range of outcomes may occur due to the regional and sector-specificity of projects. This specificity might contribute to greater (or lower) success from DBE implementation. The accounts developed in the next sections are an overview on how the analysis should be developed. They will provide interested regions with an initial screening of the net benefits from DBE implementation.

The four evaluation accounts are:

• **Financial account.** This account looks at the expected revenues and expenditures from DBE implementation. Its aim is to explain the financial cost of DBE, in order to determine if the project is efficient from a private market perspective (Campbell et.al., 2003). It also looks at the OC of the projects funding.

• **User/Consumer account.** The account describes the net benefits to users and direct beneficiaries from DBE implementation. It values the user's maximum WTP for DBE in comparison to the baseline of DBE 'no-adoption'. It is meant to evaluate net impacts in terms of productivity, competitiveness, efficiency, business connectivity and innovation.

• **Economic Development account.** Two key questions are addressed in the economic development account. First, it looks at the amount of income and employment (incremental effects) that is likely to be generated from DBE implementation. Second, and more important for CBA, it analyzes the significance that these effects have on the regional economy.

• **Social account.** The account looks at significant community and social impacts (externalities) from DBE implementation. The aim is to understand the positive legacies to societies on using DBE. We are particularly concerned on how DBE contributes to reduce income inequality between the concerned region and the country and between the country and the rest of Europe.

The final overall assessment is not meant to answer whether DBE should or should not be implemented in a particular region. It is to policymakers (and general public to some extent) to make the final decision (Shaffer et.al., 2003).

### 3. Cost efficiency of DBE projects: the financial account

Regional authorities and institutions are frequently dealing with budgetary restrictions. One of their main concerns is the financial cost of projects. This section includes the main results from an empirical exercise done with the project managers of two selected regions running DBE pilot projects: Aragón and the West Midlands. We believe that presenting the results of an ex-post analysis on this account will be useful for every policymaker interested in DBE.

Three types of costs have been identified and analyzed. Fixed costs (1) include the costs of

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16 Time and data constraints preclude a more detailed analysis.
17 Further development on the accounts is presented in the sections that follow.
18 The future streams of benefits and costs are converted into equivalent values today using a discount rate (net present value).
19 I would like to thank Rod Shelton, Javier Val and Nagaraj Konda for their hard work and disposition to participate in this exercise. Paolo Dini and Francesco Nachira provided valuable inputs and comments.
20 The analysis covers the period from November 2003 to January 2007.
21 Every interested region on DBE should expect to incur in (at least) these costs for DBE implementation.
the digital ecosystems infrastructure; research and development costs; and other fixed costs. Variable costs (2) include training costs, training travel, research costs and other variable costs. Operating costs (3) include human resources costs, infrastructure maintenance costs and SMEs service integration costs (deployment). Table 1 summarizes the financial costs for both regions.

### Table 1: Total financial costs for pilot implementation of digital ecosystems in the West Midlands and Aragón (November 2003 – January 2007)

<table>
<thead>
<tr>
<th>Cost type</th>
<th>West Midlands</th>
<th>Aragón</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thousand Euros</td>
<td>Thousand Euros</td>
</tr>
<tr>
<td><strong>Fixed costs</strong></td>
<td><strong>% of total costs</strong></td>
<td><strong>% of total costs</strong></td>
</tr>
<tr>
<td>Cost of digital ecosystems infrastructure</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Research and development costs</td>
<td>0</td>
<td>120</td>
</tr>
<tr>
<td>Other fixed costs</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total fixed costs *</td>
<td>9</td>
<td>124</td>
</tr>
<tr>
<td><strong>Variable costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training costs</td>
<td>10</td>
<td>174</td>
</tr>
<tr>
<td>Research travel</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Training travel</td>
<td>26</td>
<td>16</td>
</tr>
<tr>
<td>Other variable costs (events, conferences, etc.)</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>Total variable costs</td>
<td>43</td>
<td>244</td>
</tr>
<tr>
<td><strong>Operating costs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Resources costs (admin; management and R&amp;D)</td>
<td>277</td>
<td>110</td>
</tr>
<tr>
<td>Infrastructure maintenance costs</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>SMEs service integration costs (deployment)</td>
<td>100</td>
<td>700</td>
</tr>
<tr>
<td>Total operating costs</td>
<td>377</td>
<td>820</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>429</td>
<td>1,188</td>
</tr>
<tr>
<td><strong>% of total costs</strong></td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes: * In the case of the West Midlands, Total fixed costs include an audit and balancing item equal to 5K Euros. This value represents 1% of total financial costs for the region.

Source: DBE questionnaire to pilot project managers, 2006.

Total financial costs of DBE pilot projects are very different in absolute values in both regions (429K Euros in the West Midlands and 1,188K Euros in Aragón), but are distributed in the same pattern according to cost type. The largest proportion of total costs is operating costs, followed by variable costs, and fixed costs. Pilot projects data shows that between 2.20% and 10.40% of total costs are fixed costs. Surprisingly in this distribution is the low participation of the digital ecosystems (DE) infrastructure in total costs. DE infrastructure represents only 0.90% of total costs in the West Midlands (3.88K Euros in absolute values) and 0.29% in Aragón (3.50K Euros). Scientists have expressed that there is an overall belief among policymakers that DE infrastructure is 'expensive' and in consequence 'unreachable' for their regions. Evidence in our sample pilot projects does not leave place for this argument. In contrast, our analysis shows that between 10% and 21% of total costs are variable costs (mainly training costs and training travel); and more than 70% of total costs are operating costs, including human resources costs and SMEs service integration costs (deployment). Most of these costs are certainly an investment on regional development, as resources are allocated in knowledge creation and dissemination. Policymakers should compare financial costs with benefits produced in the user/consumer account and social accounts when assessing the net benefits of DBE implementation.
Important in this analysis is the role of the regional catalysts in cost allocation. We believe that costs are determined by the regional priorities and regional catalysts leadership initiatives on innovation. Shelton (2006) has identified three different approaches to DBE according to the regional catalyst organisation: the government funded approach, the local association approach and the public company approach. The DBE approach chosen by the interested region will directly affect the CBA financial account\textsuperscript{22}. Our empirical study highlights that in the early stages of project implementation regions focus on SMEs service integration, training and dissemination of the concept of DBE among regional SMEs. Regions allocating more financial resources to these activities will see their costs on the CBA financial account increase, but this change might be more than compensated by the benefits gained under the other three accounts. For instance, the region of Aragon, following the government funded approach, has been really active in developing SMEs service integration\textsuperscript{23}. The government funding has been accompanied by an active participation of the concerned SMEs in R&D (equal to 484K Euro in the period), creating a feeling of entrepreneurship among SMEs. This scheme could further develop into a public-and-private partnership (PPP), whose non-marketed benefits are difficult to value.

Costs projections show that an average cost reduction of 19\% is expected for both of the studied regions by the end of 2007 (costs are expected to decrease by 23\% in the West Midlands, and by 16\% in Aragon). Benefiting from economies of scale, further costs reductions are expected as projects reach maturity.

The financial costs described above are generally financed by three different sources: European Commission (EC) funds, regional contributions (funding from the regional government), and private contributions (funds by the regional private sector, i.e. the concerned SMEs). The sources of funding and its participation in total costs will vary according to the approach to DBE chosen by the region, but also by sector and stage of project (Shelton, 2006). Figures for the West Midlands and Aragón are presented in table 2. In both of our studied regions most of the funding come from EC funds (79\% of total costs in the West Midlands, and 46\% in Aragon), followed by regional contributions in West Midlands (21\% of total costs) and private contributions in Aragon (41\% of total).

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|}
\hline
\textbf{Source of funding} & \textbf{West Midlands} & \textbf{Aragón} \\
& Thousand Euros & \% of total costs & Thousand Euros & \% of total costs \\
\hline
European Commission Funds & 338.91 & 78.92 & 548.85 & 46.19 \\
Regional contributions & 90.54 & 21.08 & 155.00 & 13.05 \\
Private contributions & 0.00 & 0.00 & 484.25 & 40.76 \\
\hline
\textbf{Totals} & 429.45 & 100.00 & 1,188.10 & 100.00 \\
\hline
\end{tabular}
\caption{Source of funding in the West Midlands and Aragón (November 2003 – January 2007)}
\end{table}

Source: DBE questionnaire to pilot project managers, 2006.

Policymakers should be careful while analysing the costs related to public funding. OC of public funds are central in a CBA. In principle, as Shaffer (et.al., 2003) states “more spending in the (DBE) project would […] reduce the amount of regional government

\textsuperscript{22} As a consequence of the chosen approach, further indirect effects on the user/consumer account and social account might be expected.

\textsuperscript{23} The region has assigned 155K Euros from November 2003 to January 2007 for SMEs service integration, and has already committed 157K Euros for these activities after January 2007.
(institutions) spending available for other initiatives in the region”. A proper CBA must recognize that if undertaking DBE while involving a net flow of public funds, the deadweight loss (DWL) associated to the collection of these funds should be attributed as a cost of DBE implementation. In the same way, if DBE implementation involves a net inflow of public funds, the project must be credited with the DWL of raising these funds in another way (Campbell, et.al., 2003). In all cases, the fall in the CBA financial account net benefits will be matched by an equivalent (or more than equivalent) rise in the net benefits in the other three CBA accounts.

Again, higher financial costs do not imply cost-inefficiency, as evidence shows that these costs are related to the regional engagement with innovation. We would expect that if costs are incurred in the short-run (paid by the regional effort of the current generation), the benefits of investing in innovation are expected in the long-run, favouring a broader range of population due to secondary benefits and multiplier effects that innovation is expected to create on the regional economy. While analyzing this future stream of benefits we must take into account the net present value (NPV) of the benefits. NPV is also central in CBA. This concept expresses Euro values in different years in equivalent terms, recognizing that 1 Euro spent today is more costly than a Euro that will be spent in one year’s time. The NPV is calculated using a discount rate. The lower the discount rate, the greater the emphasis policymakers give to long term benefits (DEAT, 2004). Regional authorities and policymakers devoted to the development of its region should easily realise that the financial costs incurred from DBE project implementation will be more than compensated by the benefits stemmed by the other CBA accounts to be analyzed below.

4. The net benefits to DBE 'users': the user/consumer account

This account explores the net benefits to users/consumers as what DBE implementation provides them. Users/consumers are mainly SMEs, but large enterprises are not excluded. There are 44 SMEs currently connected through the DBE infrastructure in the West Midlands and 35 SMEs in Aragón, serving a variety of sectors. Different net benefits are expected according to the roles of SMEs in the market. Shelton (2006) has identified four types of SMEs characterized by their different roles in the market: early adopters, implementers, discoverers and users. Early adopters focus on new approaches to software development, while implementers SMEs apply the original work of the early developers in a particular sector of business. Large benefits are expected to driver SMEs (early adopters) and implementers. As these SMEs focus on software development, the formation of software communities in the regions is favoured. The West Midland's SMEs (drivers and implementers) have expressed that one of the main attractors that made them participate on DBE was to be at the forefront of research into software development with world leaders and other university partners (Shelton: 2006). This reveals a real 'entrepreneur' attitude towards innovation. Discoverer SMEs are those SMEs that are willing to adopt a service in their business (and work with the implementers) but do not wish to involve themselves in activities that require high-level technical abilities. These SMEs would be benefiting from connectivity with other SMEs. They would also experience some innovation while adopting

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24 In the West Midlands, four large enterprises-SMEs linkages have been formed or are forming.  
25 The West Midlands pilot project has been addressed to five sectors: tourism, manufacturing, business services, nanotechnology and bio-sciences. The Aragón project has been focused on the tourism sector, but other related services include taxi float management systems, ERPs, access control, e-commerce and accident management systems.
a service in their business. 'User SMEs'\(^{26}\) would be implementing aspects of DBE in their business model (without being involved in technical software issues), and then benefiting from connectivity with suppliers and customers. For them, DBE will help to connect them with potential customers in B2B and in B2C transactions. In all cases 'DBE users' will be benefiting from improvements in productivity and competitiveness of their business.

Monetary valuations for these benefits are hard to conceive. We recognize the uniqueness of DBE and in consequence the difficulty to assess its impacts. We believe that until 'critical mass' is reached the range of possible outcomes from DBE implementation will remain wide. For 'user SMEs' incremental sales (or reduced costs) could help in the effort of valuation\(^{27}\). Incremental profitability (increased producer surplus) of concerned SMEs could be used as an indicative variable to measure WTP. Until now, pilot projects have not benefited from sales increases from DBE implementation\(^{28}\). This is understandable due to the early stage of the projects. The region of Aragón has expressed that the reason for no quantifiable benefits include platform instability and DBE applications not been yet applied in real business. SMEs in West Midlands have expressed that being connected has helped them in developing new enhanced services at lower cost and with greater market reach.

Most of the benefits to DBE users/consumers described above are not traded, and in consequence, no market prices for them exist. But this does not mean that these benefits (goods) have no value. According to DEAT (2004), the values of non-marketed goods can often be inferred from economic behaviour and from the study of related markets. The study of these related markets is region-specific. Available information provided by pilot projects is limited. Generalising these effects (and benefits) to other European regions is not possible. It is for every interested region in DBE to assign value to these benefits. If it becomes impossible to measure them, or if the measurement is subject to large errors, Campbell (et.al., 2003) suggests to summarize the net benefits in a form of Impact Statements (IE), by identifying the qualitative effects to 'DBE users' from DBE implementation. A disadvantage of this approach is that these qualitative net benefits are not comparable with the costs and benefits raised under the CBA. Nevertheless they will be effective in providing policymakers with a complete view of what the net benefits to the users/consumers will be.

5. Digital Business Ecosystems and economic efficiency: the economic development account\(^{29}\)

Regional development is at the core of DBE. The economic development account will valuate the amount of income and employment that is likely to be generated from DBE implementation. Policymakers should first look at the business structure of their regions. They must identify the employment structure of the sectors applying DBE and should then assess what is the value added that these sectors produce on the regional economy. As we are

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\(^{26}\) 'Users SMEs' should not be misunderstood with 'DBE users/consumers'. The latter includes the four types of SMEs identified by Shelton (2006), plus large enterprises.

\(^{27}\) The baseline is 'DBE no-adoption'.

\(^{28}\) One exceptional case has occurred in the West Midlands, where a transaction between a driver company and an implementer valued in 40,000 GBP has been agreed for additional services due to their relationships on DBE.

\(^{29}\) The next two accounts (economic development and social) present just some general ideas to guide a deeper analysis on DBE implementation. A further study to appear in 2007 will valuate more precisely these two accounts by using an empirical analysis on the existing pilot projects. Time constrains have forced me to reduce my analysis to what is presented here.
just interested on the incremental generation of employment and in incremental income
generation, we expect that net benefits on this account will be shown in the long-run. As the
idea of DBE is conceived on the regional level in the first stages and on the European level
further on, policymakers might want to value the impact on trade from DBE implementation
in the long-run. The NPV of these impacts must be also calculated. As stated before, higher
net benefits can be expected in those countries applying DBE to the sectors where the
industrial structure favours SMEs proliferation.

CBA is also concerned about the economic significance of job and income generation. We
are particularly interested in the "multiplier effects" of DBE implementation. Multiplier
effects are the effects caused by the linkages (indirect) that the project creates with the rest of
the economy (regional, national and global). Nevertheless, these effects will only appear
once the scale of DBE deployment reaches 'critical mass'.

6. Digital Business Ecosystems and human well-being effects: the social account

The social account looks at community and social impacts produced from DBE
implementation. Policymakers deciding whether or not to implement DBE should analyse all
the costs on surrounding communities that DBE implementation could arise in their regions.
Positive and negative externalities might appear. Positive externalities are legacies to
societies. A positive externality in the social account could be the training of workers
involved in DBE (knowledge acquisition) and their increased productivity while working
somewhere else. If the scale of DBE implementation increases, there should be an interest in knowing how
DBE implementation could contribute to reducing income inequalities between the
concerned region and the country, and between the country and the rest of Europe.

7. DBE implementation decision-making: the overall assessment

The summary of the evaluation of DBE implementation presents the welfare effects
measured in monetary terms. Economic theory assumes that human well being is determined
by the capacity of people to fulfil their preferences (Munford, et.al, 2000). The approach
developed here should allow policymakers to take a decision on DBE implementation, as it
provides all valuable information on the project in order to facilitate the decision.

As many of the benefits and costs expected to be generated by DBE are hard to measure, the
regional commitment to innovation and economic development of political leaders will be
crucial on the decision making. The results presented in this paper are preliminary
conclusions based on the existing DBE pilot projects.

Evidence showed us that financial costs will be mainly variable costs and operating costs.
Regions investing in DBE are investors in knowledge creation and capacity-building. Policymakers must also realize that digital ecosystems infrastructure costs are really low as a proportion of total costs. Although, costs will be determined by regional priorities and

30 Workers and SMEs receiving training financed by DBE will keep this knowledge for a long time. In case these workers apply this knowledge elsewhere, positive externalities will be generated.
regional catalysts leadership initiatives, evidence shows that after the implementation of a pilot project (40 months in average) costs can be expected to decrease in between 15% and 20%. Further costs reductions are expected as projects reach maturity. We encourage policymakers to compare financial costs with benefits produced in the economic development account and social account, as high financial costs do not necessarily imply cost-inefficiency.

Finally, we would like to underline that the reason for considering these results as preliminary is that we believe that until "critical mass" is reached, a complete range or net benefits will become available. The velocity to reach this mass is in the hands of policymakers.

References


