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1 Introduction

The sustainability planning of DBE has its grounds in the deliverable 34.1 Business Plan that was delivered in August 2005. In that document DBE sustainability plan was put into the form of a regular business plan. The potential stakeholders were identified and emphasis was put in studying the possible organisational forms that would take care of DBE after the EU-funded project comes to its end. Also the open source revenue models were identified in this plan. The content of this first deliverable on DBE sustainability was following the guidelines given in the technical annex that described the work for first 18 months. As described in the first TA WP 34 objective *was to make sure that DBE receives market acceptance by SMEs. This Work Package assures the exploiting and sustaining of DBE software consisting of software infrastructure and software services. The tasks consist of creating the strategy for the exploiting the project results, creation of the business and marketing plan for the project results and the starting up of DBE organization. Business plan contains description of business idea including software products and related services; market segments, value-nets, revenue models, financing, competitor analysis and growth perspectives.*

The business plan was accepted and the next follow-up deliverable was 34.5.1 DBE Sustainability plan. The deliverable followed the outline of the business plan deliverable and concentrated in the governance model of DBE and suggested a process for the creation of a DBE Foundation agreement. The deliverable had leapfrogged to a conclusion that foundation was to be the desired organisational structure because that had been the main focus of the sustainability discussions inside the consortium. That had not been decided on, however, and concentrating on that point turned out to be a mistake of the authors of the deliverable. The feedback provided by the project reviewers regarding the rejection of the deliverable D 34.5.1 is quoted in the next paragraphs as it provides the ground on which this deliverable is built on:

This Deliverable builds on two previous ones. In the introduction it is stated that “This and the forthcoming Sustainability Plan deliverables are based on the First Version of the Business Plan for DBE Organisation. The market vision presented in this report is based on the deliverable 5.1.1 First Assessment of Business Domain and Integration into a unique Vision”.

Instead, as stated above in this report D34.5.1, the document on which this current deliverable is based regards its first version of the business plan “...as an outline for the business plan is an acceptable document...” meaning the base was no more than a mere outline. Furthermore in D34.5.1, the study of the market environment and business idea of DBE are explicitly deferred to the next sustainability plan draft while the future governance of DBE is the main issue of this deliverable. This is reversing the usual procedure, where you first study the setting, the environment, the market, and then choose what you can do and how you will do it. Or you establish a set of possible scenarios and discuss them, with pros and cons.

Anyway, a market situation analysis is provided, but it copies almost word for word pages 21 to 25 of D 34.1 (!?). Nothing new!

Chapter 3, Towards a Sustainable Community Governance Model focuses on Governance issues. This begins with a background for putting up a Foundation where it reckons the choice of a form of legal entity as one key strategic decision and claims that “Different types of legal entity were discussed in D 34.1...”. Nonetheless, we cannot call a discussion something that is little more than one page listing of some legal entities, with some description and with very little discussion of their relative merits in regards to DBE!

The deliverable then presents a “benchmark” with other relevant organisations, again with descriptive value but with no debate on the relative merits or relevance to DBE. It then proceeds directly to debate the “Open process of Creating a Foundation” benchmarking the OASIS consortium as if the decision on the creation of DBE Foundation was already a fait accompli! During the review, when faced with a question on the rationale for this “choice” for a Foundation a TCH representative said he was not aware of any... A reference to a PMEB decision seems to explain this choice but what could well be inferred from the paper and discussions is that it is possibly a TCH and IBM judgement but not (yet) a widespread and common feeling within the project. Then, relating to the results of the SWOT analysis performed in Tampere in a DBE Technology workshop and specifically to a requirement of “Long term credibility and attractive brand” it is derived that “...the current credibility of DBE project is based ...on the trusted regional catalyst and on the active role of a few key players (IBM, Sun, Intel)...” which might be true but is far from being demonstrated. That statement is reinforced with this “...regional catalysts and big industrial players should...have a central role in DBE governance alongside with the SME Community...” but it recognises at last that “...this is a partial view... until now there has not been such a discussion in the other regional and catalyst and SME insofar”.

The project should realize that governance is different from sustainability as clearly stated by the social scientists, even though it is interrelated. It is premature to discuss the organizations to be put in place before identifying the requirements of the various stakeholders of the projects and then discussing sustainability from their perspectives. It seems thus there is yet a long and widespread debate to be had on sustainability, and how it could be achieved, and only then to proceed to a choice of the best “organisation” to achieve the agreed strategy. Until then a decision on a specific model of Governance such as a Foundation is largely premature!

The deliverable D34.5.1 is rejected because it is not a sustainability plan for the many reasons that emerged in the open discussion. In spite of rejecting this deliverable on the grounds discussed above, the resources needed in producing this deliverable should be accepted, provisionally since resource figures are not yet available, if the next draft of the sustainability plan due at the end of April 2006 provides what is needed to be called a sustainability plan.

After the rejection of the deliverable and receiving the review report from the second annual review of DBE project, an open planning meeting regarding DBE sustainability was held in March 1st in London. Representatives from IBM, Intel, ITA, LSE, TCH and UCE were present at the meeting chaired by Mr. Räsänen from TCH. In the meeting a wider perspective was agreed for the sustainability debate and guidelines for the writing of the next sustainability plan were collectively agreed on. One of the starting points of the meeting was the statement in the review report, in which the computing domain of DBE project was named as the responsible party for

the sustainability of DBE code base¹. Realizing this and acknowledging that the science domain of DBE has been directed into following the DBE Science Roadmap (final deliverable D18.6. in December 06), which is the core sustainability plan for science², it was agreed that the sustainability planning of the deliverables in WP 34 will from now on focus on **regional sustainability**. Finally, initial sustainability requirements for regional sustainability were identified. These requirements are presented in Chapter 4.

After the London meeting, forum topic “sustainability” was put up on the DBE website. The first posting included the London meeting memos and all relevant appendices and emails to it. The purpose of the forum is to increase the transparency of the sustainability plan creation and debate and to get feedback to the sustainability plan from the stakeholders of DBE. It is part of an open consultation process that will be documented in deliverable D33.4 (Community consultation process conclusion) in July 06.

The timeline for the final sustainability deliverable D34.5.3 was aligned to that of the Science Roadmap and that of the final Business Vision D5.1.3. – jointly set to December 06. The DBE conference in November 06 was agreed to have the character of a launch event for post-project DBE sustainability. It will be extended by a dedicated event for the cross-regional DBE community.

This report is meant as an intermediate step and will take the sustainability plan into a new course that has been collectively agreed within the consortium and provide all crucial elements of the final plan. The sustainability plan has been written as a joint effort led by TCH and contributed by FZI, ITA, LSE and UCE. In the planning session also representatives from IBM and Intel were present. The final sustainability plan is refined based on the feedback and new information accumulated before the end of the final project.

This deliverable is structured in the following way; in the second chapter first the relationship and definition of sustainability and governance are presented. Then sustainability is perceived from social sciences, software developer and business perspectives in order to give a wider conceptual basis for the report. In the third chapter the framework of sustainability planning is laid out by identifying the different layers of DBE, analysing stakeholder groups and their relationships and approach to sustainability. Finally the aspect of time in sustainability planning is considered in short. The fourth chapter presents the current regional sustainability plans of the three pilot regions, Tampere, Aragon and West Midlands. The regional plans begin with description of regional setting in regards to sustainability. Then the regional requirements, actions and resources are presented, reflecting the sustainability planning framework. The final fifth chapter sums up the key conclusions of this deliverable and identifies the next actions in the process towards the final sustainability plan deliverable.

¹ DBE Second Review Report, page 44

² DBE Second Review Report, page 7

2 Different perspectives to DBE Sustainability

2.1 *Relationship of sustainability and governance*

As a term, the word sustainability originates from the field of natural resource management. In this field, there is recognition that some kinds of resources are used by many individuals ‘in common’. An example could be a water supply or perhaps an area of land on which a number of people graze animals. In these scenarios, the lake or field is viewed as a resource system and the water or grass that individuals appropriate from it are described as resource units (Ostrom, 1990). In these examples, it is recognised that if the overall quality of a resource system is to be maintained, then individuals cannot make excessive demands on it. For example, if one individual chooses to graze a large number of animals on a piece of common land in order to benefit themselves, then the overall quality of the land will deteriorate, to the detriment of the others who have need of it. Hardin (1968) refers to this particular set of circumstances as ‘the tragedy of the commons’, where individuals think chiefly of their own concerns, disregarding the impact their needs may have on others or on the long term sustainability of the resource system.

In this particular example, sustainability refers to the need to oversee situations where resource systems can become overcrowded or overused to the extent that their ability to produce resource units is put in jeopardy. In the past, two schools of thought have dominated the way in which ‘common pool resources’ such as these have been viewed. The first school of thought argues that only the state can manage these kinds of resources in a fair and responsible manner and the second argues that management of such resources is best carried out by private sector organisations. What is common between these schools of thought is that the resource system is always connected to a notion of “ownership” – being it public or private. In that understanding control of the resources is mostly *centralized*. What is however emerging in the context of open technology architectures is a concept of *distributed* use and development without ownership and centralized control. Benkler (2004) argued that this leads to a new mode of organizing economic production that he calls “social sharing” and that has to be distinct from the more traditional market and state schools as discussed above.

In principle, therefore, sustainability refers to the requirements necessary to permit a resource system to produce resource units over the long term. Determining *who* should be responsible for ensuring these requirements are met and decisions regarding *how* use of the resource system will be organised are issues of governance. Governance of a shared resource system implies a model of organisation that is negotiated and consensually agreed upon by stakeholders. This contrasts with traditional hierarchical organization, which is principally concerned with top-down methods of co-ordinating behaviour within the bounds of a single organisational entity. The term governance therefore tends to be used in situations where a bi-lateral approach to organisation applies i.e. where a number of otherwise autonomous individuals and organisations are required to act collectively. In these situations phenomena of “collective action” (as e.g. described by Olson – 1968 – and commonly used in political science analysis) may appear such as silent control by sub-groups of the community. Governance need to balance out these phenomena and ensure the longterm openness of the shared resource system.

An interesting question surrounding the sustainability of DBE is that, unlike the common pool resources described above, DBE infrastructure does not diminish with use, in fact it expands. It is conceivable that capacity of the physical infrastructure could be exceeded and overuse in this sense could occur. However, overall, the more business models that are described within the infrastructure the more connections and combinations will be possible which should enhance the usability of the infrastructure. Unlike a natural resource, therefore, instead of trying to limit appropriation to ensure sustainability, in the case of DBE, there are advantages to allowing open access to the infrastructure and encouraging use. In this sense, DBE in its current form depends on being organized in a shared way. First key question then becomes how to organise and motivate stakeholders to share responsibility for maintenance and provision. The second key question becomes how its character of openness can be ensured in the long term.

In order to understand what kind of motivations exist, the resource units that DBE is capable of producing need to be understood from a multi-stakeholder perspective. Different users will derive different benefits from using or engaging with the infrastructure and it is these interests and motivations that need to be harnessed. The DBE infrastructure provides a different way of electronic business creation and interaction. Ideally, this would lead to a 'tangible business benefit to an SME' directly derived from this new mode of electronic business (as in efficiency gains, market access or new business models) since this has been the aim of the development process. However, since the infrastructure as well as the SME community using it is in a process of early formation, individual benefits and motivation develop over time and are currently as connected to the participation in the DBE initiative as to the promises of the infrastructure. This means that sustainability needs to pay attention to the *time factor* and the current, near and long term motivations as well as possibilities of stakeholders to participate in the DBE.

2.2 *Different stakeholders and their approach to sustainability*

Two approaches to the identification of DBE stakeholders are presented in this chapter. The first one is looking at stakeholders in DBE sustainability context dominantly from software developer SME point of view. The second one perceives DBE from the "bird perspective" of the Digital Ecosystem Cluster of European Commission. These perspectives are seen as mutually supplementary.

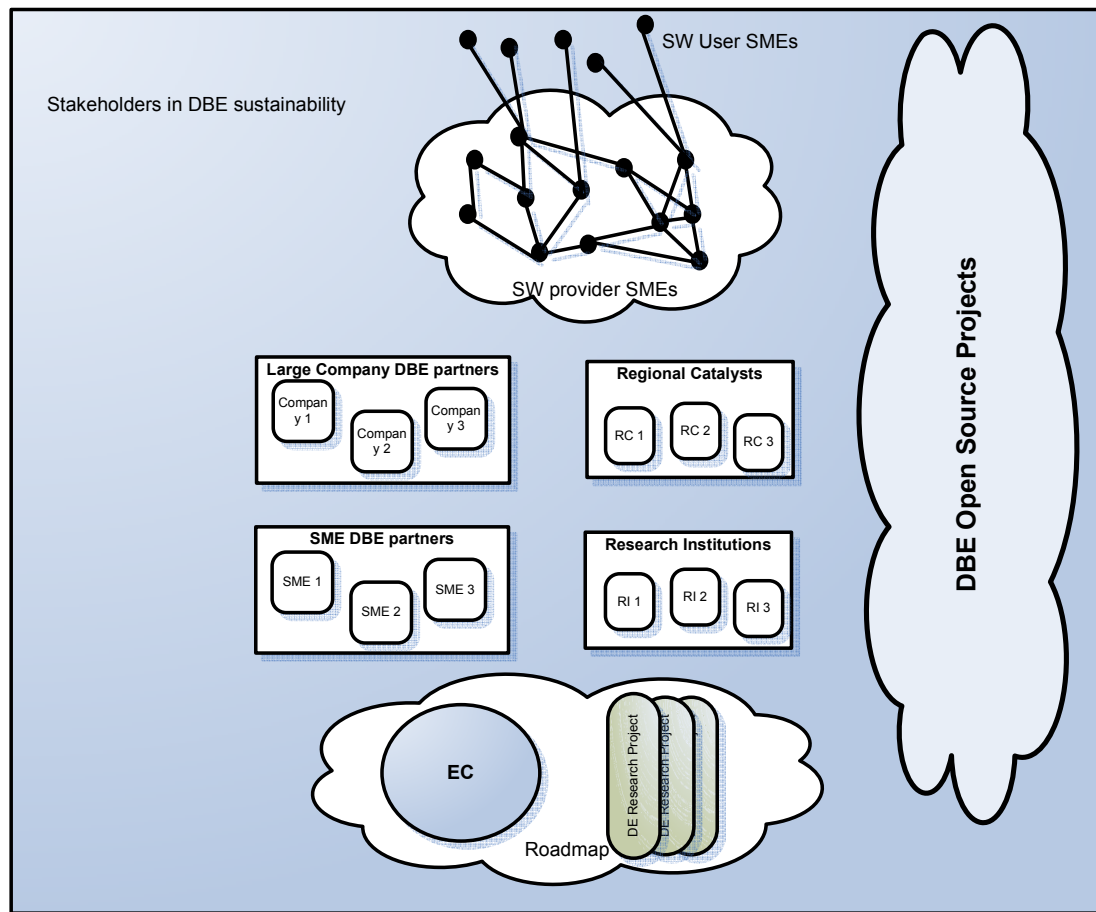


Figure 1. Stakeholders in DBE sustainability³

In the figure 1 the different stakeholders are grouped based on how they are seen by SMEs participating DBE project.

Software providing SMEs are linked together by means of DBE. They also have links to the SME users. They have connections to DBE open source projects, but their role in OS projects can vary depending on the nature of their business. Software users' connection to DBE is mediated by SW developers. Later the software users form their own group that has connections to the software developers *through* DBE.

In the figure the SW users are named as SMEs, because DBE is targeted to meet specifically SME needs, but the software users can as well be large companies. The take up of DBE is predicted to follow the classic technology adoption process presented by G. Moore:

³ Rissanen & Räsänen 2006

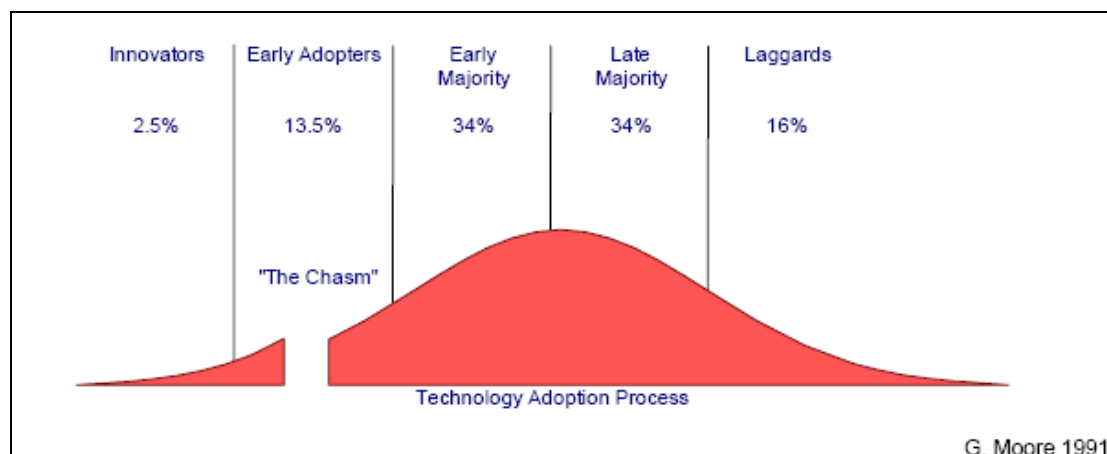


Figure 2. Technology Adoption Process⁴

DBE SME engagement is planned in a way that Driver-SMEs are the innovators from the software developer side. Implementers are early adopters that can utilize the experiences that Drivers have had and begin building up the community and only the success in their engagement would be adequate to cross the chasm. Likewise, from the software users' side the Discoverers are innovators that first take DBE environment to their business and innovate ways to utilise it. Users are the followers that make up the larger user base.

At the moment a common understanding within DBE consortium seems to be that regional catalysts will be needed also after the project has ended to foster the local activities of taking DBE into action and cross the chasm. As the project funding ends with the project, these activities need to be financed as part of the regional catalysts regular activities. In chapter 4 the sustainability plans of the three regional catalysts that have been project partners are presented. These plans are examples of the ways regional sustainability can be achieved by regional catalysts and other stakeholders at each individual region.

DBE (project) is a research project and many of the research questions raised during the project will not have answers by the time project ends. There are several new research projects beginning and these projects will have strong connections to the initial DBE. Research institutions are more likely to participate in DBE through these research projects than unfunded directly to DBE.

Companies that have been partners in DBE project will each have their own sustainability plan participating in DBE in the future. All partners have had their reasons in the first place to take part in a large EU research project and that plan very likely has included also plans for future exploitation of the project results.

European commission has its visions of the digital ecosystem research. These plans and visions are explained for example in the digital ecosystem position paper⁵. Digital ecosystem research will be continued in the 6th framework programme in three projects and in the beginning 7th framework programme. The technologies created in

⁴ Moore, G. A. Crossing the Chasm 1991

⁵ Dini P. et al. The digital ecosystem research vision: 2010 and beyond

Digital Business Ecosystem project are not, however, the only ones supported by the EC, but instead a more holistic and neutral approach is taken.

The open source projects will make the final stakeholders in this figure. The open source projects will have participation from the above described stakeholders in different ways. The sustainability of the OS projects requires a large community which requires that a number of individuals and organisations outside the initial project partners are interested in taking roles in the community. Achieving this objective is the most crucial in DBE sustainability in the long run.

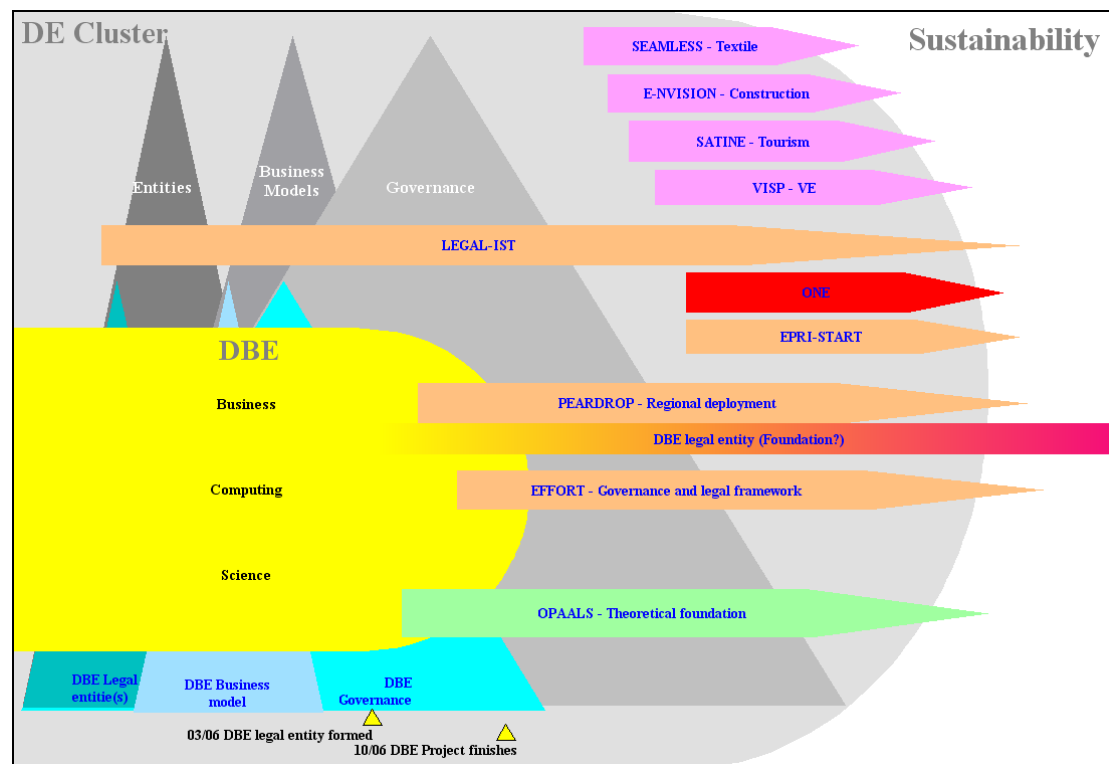


Figure 3. Sustainability Organogram⁶

In this figure the sustainability is not seen as subjective in itself but an objective that will be achieved via several specific and dynamic elements - such as new EU projects, national and local initiatives, volunteers, a DBE 'owner' organisation, and a viable business model.

DBE sits within the DE cluster, where sustainability is a common objective. Dynamic elements, such as projects and legal bodies are key tools in making progress and so are pointing towards our goal. Business models, governance models, and discussing and planning legal entities, are cross-cutting activities (vertical pyramids in the diagram) that support and underpin the active elements. Each of these discussions, and particularly that of governance, has a DBE element to them, but are also part of the broader DE cluster discussions on these topics and should ultimately fit into the DE Cluster landscape.

⁶ Rathbone 2006

2.3 *Sustainability from social science perspective*

The following section draws upon work that has been carried out by social science researchers in DBE in which the issue of DBE sustainability has been addressed. Firstly, it describes the concept of multi-stakeholder analysis as it was used by Mary Darking as part of her socio-technical analysis of SME engagement in WP27. Secondly, it draws upon the work of Antonella Passani and her analysis of social networks, which uses the concept of social capital to explore key relationships formed by regional catalysts. Thirdly, it documents important insights from the work of Evangelia Berdou on the sustainability of open source projects considered in relation to the embedded nature of knowledge and socio-economic relationships. Finally, it draws upon recent empirical work carried out by Panayiota Tsatsou and Silvia Elaluf-Calderwood that continues to refine and develop the concept of trust in relation to DBE.

2.3.1 Multi-stakeholder analysis

As a large scale infrastructure, DBE has the potential to mean lots of different things to lots of different people. In order to understand the diverse motivations that exist for engaging with an infrastructure and potentially sharing responsibility for its provision, a multi-stakeholder approach offers an effective way of ascertaining diverse requirements and motivations. The table below is taken from a paper written by Whitley and Pouloudi⁷ that takes an interpretive view of stakeholder analysis. The interpretive approach places particularly strong emphasis on the idea that all stakeholders will have their own world view and will see things according to their own perspective. The approach that Whitley and Pouloudi have developed is designed to be of particular relevance to difficult or ‘entangled’ situations involving complex information systems.

Table showing principles of stakeholder behaviour and their implications for stakeholder identification and analysis taken from Whitley and Pouloudi⁸

⁷ Whitley & Pouloudi, 2006 (in press)

⁸ Whitley & Pouloudi, 2006 (in press)

Principles of stakeholder behaviour

1. The set and number of stakeholders are context and time dependent
2. Stakeholders are inter-related
3. A stakeholder's role can change over time
4. Stakeholders may have multiple roles
5. Different stakeholders may have different perspectives, values and wishes
6. The viewpoints and wishes of stakeholders may change over time
7. Stakeholders may be unable to serve their interests or realise their wishes
8. Stakeholders have hidden agendas

Implications for stakeholder identification

- Set of identified stakeholders should reflect the context
- Set of identified stakeholders should be reviewed over time
- Consider how stakeholders are linked
- Adopt a long term perspective
- Study how roles and perceptions change
- Acknowledge diversity of interests and values
- There are different versions of who the stakeholders are (depending on whose stakeholder viewpoint is adopted)
- Viewpoints and wishes should be reviewed over time
- Acknowledge the interests attributed to the stakeholders by others
- Explore why the particular stakeholder interests are reported
- Consider conflicts and power issues

In addition to these considerations, there are a number of authors who argue that technology and technological components should also be taken into account in stakeholder analysis. That is to say that whilst technologies do not have the same status as people within a stakeholder process, they are nonetheless capable of making implicit demands on a situation. Therefore, it is not only the requirements of people that need to be considered, but also the requirements of both technical components and the infrastructure as a whole. This approach can sound like a diluted version of technological determinism where technologies rather than people are seen to dictate the course of human and social development. However, socio-technical approaches to stakeholder analysis do not take this line. Instead, they argue that the degree to which

human or technological concerns dictate what happens can vary and is completely situation dependent.

For the complex DBE technology we also have to take into account that technological understanding and abilities of stakeholders are not equally distributed. Hence, the analysis of DBE usage and contribution needs to be put in relation to stakeholders' abilities and particular understanding of the DBE. A technology aspect that might turn out to be crucial for a DBE business application of an SME can at the same time be of little interest from a researcher's perspective or vice versa. In the context of DBE, this approach could help understand how different stakeholders derive value from engaging with different aspects of DBE as both a social and technological phenomena. Understanding how value is derived and understood from a stakeholder perspective could aid the process of understanding what might motivate different stakeholders to play a continued role in the provision of DBE infrastructure or in maintaining key relationships. At this stage in DBE's development – with the end of the funded project time approaching rapidly –, both of these aspects of sustainability are at a critical stage and careful attention needs to be given to securing the short to mid-term future of key relationships.

2.3.2 Social networks and social capital

Understanding the nature of key relationships within DBE has been a central aspect of research carried out by Censis. Empirical work carried out in the regions showed how each individual region is presented with different opportunities for drawing new stakeholders into DBE. The strategic effort of regional catalysts in carefully building these relationships is noted in each of Censis' deliverables but what is also noted is that regional catalysts were most successful where they focused on linking the aims of DBE up to existing local and historical networks. In this sense, DBE provided a means of reinforcing and substantiating existing socio-economic relationships in the region. When seeking to understand motivations it is clear that the regional catalysts were pursuing a strategic goal that DBE - as a policy instrument - set for them. However, for the SMEs and other significant actors that the regional catalysts enrolled there were other motivations.

Throughout the time that Censis carried out empirical work in the regions it should be remembered DBE was in pre-prototype form. Therefore the ultimate end that should motivate SMEs to participate in DBE i.e. that DBE would offer them significant business opportunities and advantages through pan-European collaboration and access to new technology- was not yet a reality. Nonetheless, the regional catalysts did manage to enlist SMEs and other influential regional actors to become involved and this became a central research question for Censis.

From the SME viewpoint, Censis noted that for most small companies, the advantage of becoming involved in DBE was that it offered access to DBE as a *social* network. In particular, it allowed them to become part of a network that offered access to people and organisations that would have been inaccessible to them otherwise. Censis used the concept of social capital to explain these dynamics and provided a very interesting analysis of SME behaviour based on this concept. Understanding the diverse range of social advantages that can be derived from a situation was a key insight into DBE activities.

This perspective has the potential to offer more insights if it is used in the context of sustainability discussions, particularly in relation to short term sustainability actions at which time DBE infrastructure will still be unlikely that DBE will be able to demonstrate conclusive business advantages for SMEs. One area that Censis identify as holding the potential to consolidate existing social networks is training, but there again, a coherent body of DBE training material is difficult to produce while the infrastructure is still in development. The power of DBE as a policy object - as something that was instrumentally set up to activate and maintain a particular network of organisations - should remain in the short to mid-term, but if DBE is to attain genuine self-sustainability, in the long term, it will need to be able to operate independently of central funds. However, as the following two sets of research findings show, this option cannot form the immediate focus of sustainability planning until the platform has achieved a basic operational level of success and the value of DBE to its stakeholders has been realised, particularly in the eyes of open source developers and SMEs.

2.3.3 Open source

The particular circumstances of DBE are such that finding relevant cases in any body of research is a challenge and in the area of open source this is certainly true. In deliverable 18.3 written by Evangelia Berdou, the author showed that currently there is a bias towards case studies that only feature volunteer communities and focus on cultural explanations for developer motivations such as reputation or licensing arrangements. Berdou's work emphasises that whilst volunteer communities do exist, key relationships that underpin communities are nonetheless embedded in existing social structures. By extension Berdou argues that the concept of volunteer contributor in its purist sense perhaps does not exist. From her empirical work Berdou has found that volunteers do benefit financially from their contribution and companies with stakes in a particular development frequently hire contributors to hack on parts of the project they are most interested in. These are important considerations to bear in mind in DBE's quest to attract volunteer contributors and create a sustainable open source developer community.

Two important theoretical considerations that Berdou identifies in relation to open source communities are the embeddedness of knowledge and of socio-economic relations. The word embeddedness is used to capture the reality that the characteristics of open source communities are not necessarily available for study in a simple objective manner, but require an understanding of circumstance, practices and community identity. In relation to knowledge, two key issues that Berdou identifies are the organisation of software development work and the way knowledge is shared in open source communities. Communities and code bases tend to grow in parallel with contributors experiencing a high sense of shared ownership and responsibility. In terms of the way knowledge is organised, tasks are clearly modularised and often involve processes that are highly parallel.

Other actions that might also encourage the formation of a sustainable developer community that Berdou identifies are: good documentation and channels for online support and communication and connecting the project to the existing overlapping networks of relations between companies and communities which can be achieved

through prioritising the involvement of companies with a proven record in open source development. She also emphasise the need to fostering collaborative relations between volunteer communities, businesses and public institutions and sees these relations as crucial for sustainability. Finally, she recommends that connecting DBE to large scale public implementations of open source, especially government to business initiatives might also be a valuable route to pursue.

2.3.4 Critical issues for DBE sustainability and the role of trust

Some of the latest empirical research that has been carried out with SMEs is documented in Deliverable 32.4 written by Silvia Elaluf-Calderwood and Panayiota Tsatsou. Feedback from SMEs reported in this deliverable indicates that there are a number of critical issues with respect to both the business and technical sustainability of DBE. A key concern of WP32 is how the legal constituency of DBE - after the end of the project - will be described under European, national and local law. Decisions taken in this regard will hold implications for how legal issues such as the underwriting of contracts and electronic signatures will be achieved.

Among driver and implementer SMEs, DBE platform usability and its current lack of business utility have raised concerns about business objectives and the commercialisation of technical models developed in DBE environment. From the SME perspective, sustainability will be strongly influenced by the ultimate usability of the platform. SMEs are conscious that the Evolutionary Environment is not ready and won't be ready until after the end of the projects and there are other aspects of the technology that the SMEs do not yet understand how they work. At the moment, security and identity are two of the most critical issues with respect to SME perceptions of the current usability of the system. Without a viable way of sending and receiving data securely SMEs cannot take the risk of committing client information to DBE.

The SME viewpoint of DBE has been a focal organising force in the development of the platform. SME feedback from engagement events and code camps has shaped the development process at every stage. At this point in the project the SME perspective is important because it makes us aware of the gap that exists between achieving viable DBE supported business interactions and the status of the platform at this point in time. However, whilst the issue of viability from the SME perspective is still fundamentally important, it is not the sole factor in understanding the sustainability of DBE it would be wrong to focus sustainability planning purely around the SME point of view. Other routes towards achieving sustainability need to be considered such as, for example, finding applications and large-scale technology implementations that can use DBE platform.

The conceptual focus of WP32 is on trust and it is clear from the empirical data presented in D32.4 that there will be a gap between the point at which the project ends and the point at which appropriate levels of trust in both DBE infrastructure and the commercial viability of DBE vision has been achieved. This absence is of critical importance and allowing adequate time for trust building will be a vital aspect of sustainability planning.

2.3.5 Summary of social science findings

Social science has the potential to offer some valuable insights into how to approach the issue of sustainability and DBE. The analysis of DBE as a good offers a potentially interesting perspective on DBE sustainability. However, this is only one approach and there are a number of other ways of conceptualising DBE that might be equally helpful. As well as thinking of DBE as a good, DBE could also be thought of as a ‘version of society’ and analysed in terms of the socio-cultural and political standpoints. The question of what makes a sustainable society elicits a different set of issues to an analysis that uses theories of public and private goods and might be an interesting approach to consider in future stages of sustainability planning. However, both of these approaches are effectively based upon finding a plausible *metaphor* to describe DBE. The polymorphic character of DBE and its potential to mean different things, in different contexts, to different people, at different points in time, suggests that only a stakeholder perspective will yield constructive results. Trying to talk about ‘the whole infrastructure’ without stating a standpoint or interests may simply obscure more than it reveals. On the other hand, DBE usage and participation by the diverse stakeholders need to be at least complementary enough to guard the character of the DBE as a shared resource system.

The social science research on sustainability has applied various different conceptual approaches and focused on a range of different stakeholders from SMEs to open source communities. However, there are many more standpoints that could be taken. Identifying these standpoints and conceptualising related issues and concerns is likely to be one of the most challenging issues in sustainability planning.

2.4 Sustainability from Developer perspective

This section first of all describes the current computing domain partners’ viewpoint of sustainability. It therefore focuses mainly on the challenge of maintaining the code base and basic infrastructure necessary to implement and run services, and to extend the infrastructure. From a developers’ point of view the project is often seen from the perspective of voluntary Open Source project (as opposed to a joint business venture, for example).

2.4.1 Stakeholders, their Goals and Needs

In the Developer perspective, there are the following groups of stakeholders:

- Research institutions
 - Current developers (TCD, TUC, U Surrey)
 - Future developers
- Research and development departments of large companies
 - Current developers (Intel, Sun)
 - Future developers
- New voluntary developers, “the FLOSS community at large”, people who find it fun to work on infrastructure code, or who need some module to integrate into an existing OS project

- Technology-oriented SW developer SMEs who need either software modules or running infrastructure for some project; perhaps even larger technology-oriented companies. Currently there is Soluta.net and the regional drivers. Many more are necessary.

In the mid term, the goals and needs of current and future developers are the same, i.e. a current developer will not remain on board if DBE is not attractive to his peers who are not currently DBE developers. This is especially true for research institutions and departments with their high fluctuation rates.

What are the goals and needs of these stakeholders regarding DBE infrastructure?

Research institutions and departments

- Use the infrastructure as a base, test bed for future innovative ideas
- May be interested because of access to future EU funding in the ecosystem area

It is very important to this group that the technology remains completely open, and that “experiments” are allowed. Many existing technologies are avoided by researchers because they are too complex or hard to set up. An infrastructure with fairly **independent modules** of limited complexity is therefore more valuable for researchers.

The **FLOSS community** may be interested mostly in the more technical components, e.g. the distributed storage or the MOF-based Query Engine (implemented as part of the Knowledge base / Query Formulator), independently from the Business Modelling language. **Modularity** therefore is important, as well as compliance to **Open Standards** and good integration with established Open Source infrastructure (such as the Apache Web server). The code must have a certain level of maturity in core functionality, since these people are more easily motivated to contribute extensions than to fix other developers’ bugs.

Technology-oriented SMEs may be interested in either individual software modules or in connecting to the running infrastructure as a whole. The running infrastructure may be interesting either for its infrastructure services or for the business facilities (e.g. payment) or services (e.g. weather forecast) offered through it by other providers. For the former, modularity is important; for the latter, good integration and a certain degree of maturity and reliability of all parts together.

2.4.2 What infrastructure needs to be in place at the end of the project

Code base

- Well-modularized (clear interfaces, independently usable sourceforge subprojects, clear directory structure within each subproject)
- At the same time: Well-integrated within.
- Easily integrated with other technologies (standards compliant).
- Documentation – within the code (+ javadoc API documentation)

Running, stable DBE infrastructure and first applications for real businesses

For a credible infrastructure, one should be able to observe some real usage and application cases that are build with the help of the infrastructure. The best candidates

are the SME driver and implementer cases already underway. How this can be extended in the future is discussed under “regional sustainability”.

Running “playground” infrastructure

The playground infrastructure need not necessarily be linked to the one running real businesses, and there are good reasons to separate the two. The playground infrastructure should serve to demonstrate concepts to new developers, creating a “Wow, I’m now part of the network” effect.

Reusable models, patterns and similar artefacts

The running BML knowledge base should actually contain some reusable models. Some structure so new models, SDL interfaces etc. can be published and found by others (at the moment, the lamia node contains a linear list of models under <http://www.mySME.com>. Most keyword searches do not return any results – some structured view of all that is available would be more useful at present.)

Introductory material

Full documentation would be nice, but some introductory material together with a reasonable API documentation often works and is quite standard in these kinds of Open Source projects.

2.4.3 Completed and ongoing activities for sustainability

The desired modularity, openness and compliance to popular standards, as requested by the last review in Tampere, have been addressed by recent measures:

Modularity: About one year ago, the code base has been divided into two large Open Source projects, published on Sourceforge. The two address distinct developer communities. The execution environment, “Swallow”, is a low-level infrastructure based on “naked” Java, Web service concepts, and the “Fada” infrastructure provided by Sun. It addresses a community of engineers with a purely technical background, often in Peer-to-Peer systems or in (technical) Web services.

This demands a more in-depth analysis of the technical demands and roles to provide a stable DBE infrastructure and of the possibilities to set-up regional or application case specific DBEs.

“DBE Studio”, on the other hand, is very much based on Eclipse, and addresses the communities of business process and enterprise modeling, Semantics/Ontologies, OMG standards, and Business Web services.

The SBVR editor is currently an isolated project working towards a second-generation BML, but addresses similar communities, especially those interested in OMG standards and semi-formal, text-based collaboration, which is certainly a discipline which will receive attention in the next few years.

Compliance with Standards: This has been a goal since the beginning, but is reinforced with the strict separation between “Swallow” and “Fada”. According to the developers, it will not be hard to make Swallow work with Web service standards as an underlying technology instead of Fada, although at the moment, certain ad-hoc qualities would be lost.

Openness: In order to prepare the transition to an open community, developers are now using the public Sourceforge mailing lists instead of project-internal mailing lists.

2.4.4 Planned activities and activities after the end of the project

Regarding openness and accessibility, all necessary documentation, deliverables etc. will be moved to a publicly accessible server (possibly Sourceforge). Links between the Sourceforge site, mailing lists, and the various blogging sites will be improved. An easily accessible Servent node with all the current examples (currently the “Lamia” server run by TUC) shall be available under a constant domain name, even if run by different institutions over time. The same goes for the DBE portal and the current digital-ecosystem.org site.

In the immediate future, the playground infrastructure and stable infrastructure can be kept up by the partners involved in the follow-on research projects. Research institutions usually have the necessary flexible data centres to keep it running independently of current projects. Some research departments of large companies may have the possibility as well.

When there is sufficient real business activity, then it will make sense to separate the playground/research and the stable/business infrastructure.

2.4.5 Community identity and modularity vs. integration

Reviewers demanded “a plan and manifesto to launch an ‘Open Digital Ecosystem’ open source community”. The idea of one single community under the banner of ‘Open Digital Ecosystem’ was met with some resistance by developers. Partners agree to try and develop such a community, but don’t necessarily see themselves as part of it, let alone declare, for the moment, that they would like to lead it themselves. On the other hand, most partners are interested in continuing their developments and investments within the thematic communities mentioned above.

A possible explanation is that many have experienced the DBE project as one where a lot of effort was required for integrating the contributions by the different disciplines; where a high percentage of time had to be spent on clarifying terminology, objectives, and accommodating “political” demands, while the typical engineer or Open Source developer prefers working among his/her peers in an environment where objectives, or customer demands are clear and stable. One would therefore fear that a large community representing all disciplines represented in the current DBE project would be equally complex.

Several partners also doubt the desirability of one large DBE community from an external, innovation policy point of view.

Firstly, with several small communities, it is more acceptable to let true evolution happen, i.e. the strong communities survive, the small die out, perhaps being replaced by external communities able to fill in the same role. Secondly, if the existing small communities and artefacts are able to establish strong links to other, existing or new projects, even at the cost of weakening the current integration between them, this enhances their overall impact and chance of survival.

This reflects a viewpoint where, rather than “starting an ecosystem”, one strives to integrate into the existing ecosystem. The conceptual foundations for the DBE project were laid circa 2002 and in the computing domain, a few things have moved forward since then. E.g. service-oriented architectures have been universally accepted (and are beginning to be criticised for a number of reasons as experience builds up), there has been “Web 2.0” and “Social Software”, and some more realism regarding a future “Semantic Web”. Partners are therefore eager to embed the innovations of the DBE project into this dynamic ecosystem.

While this is good for innovation as such, a few questions remain: Can the specific goals of the DBE project (such as SME internetworking) be attained by such an approach? How can the needs of those already connected and future technology-oriented SMEs be addressed who want to use a stable infrastructure and have a single point of contact? How can the integration between the different modules be preserved in future releases?

Integration as such may be preserved quite naturally where there are vertical relationships between modules, or in other words where a module cannot run without another module. “DBE Studio” will not make changes that are incompatible with current versions of the “Servent”, because it will simply not run. If the “Servent” community decides to make incompatible changes, take-up of this new version by Servent users will depend on the availability of attractive applications for it, so there will be a natural interest to involve the “DBE Studio” in the planning process.

2.4.6 Developer and business communities

Developers consider themselves mainly as part of an engineering community, not a community of implementers or disseminators. They suggest that the business needs of a single point of contact or regional points of contact are best served by a business community.

While the developer community is structured around code modules and technical disciplines, the business community would be structured according to regions and industries. The developer community should, according to this view, be mainly based on voluntary, intellectually motivated contributions and on DBE as an attractive platform for interesting research and experimentation, with little need for formal hierarchies, legal liabilities, or marketing resources, the only material cost being that of keeping the infrastructure running. The business community, on the other hand, is more likely to be motivated by business interests, of being able to benefit from the infrastructure and existing deployment in order to implement new services faster and more cheaply. The business community will have a greater need for a legal identity, for a marketing budget etc.

The main operative link between the two communities would be provided by companies who are involved in both communities. An international DBE foundation could also provide a link by organising developer meetings where developers have a chance to see each other and come into informal contact with their users in different regions.

Some large Open Source projects already function according to this model. With GNU/Linux, there is quite a strict separation between the various engineering communities centred around individual technical components (such as the Kernel, the Desktop, utilities or specific hardware platforms) on the one hand, and various

industry alliances on the other hand. The Apache project is an example for a more integrated community, which is perhaps related to the fact that the project was started by users and administrators rather than developers.

2.5 *Sustainability from business perspective*

From business perspective one of the main starting points is to understand the DBE as a shareable resource that either receives or does not receive market acceptance of users and that competes with other similar resources (e.g. competing web-service or middleware technology solutions, online-marketplaces etc.). A sustainability plan is often interpreted as a sustainable business plan of an organisation. Even though the sustainability plan for a project such as DBE is much wider concept than a mere business plan, the business plan analogies should nevertheless be studied and learned from where applicable. Even if DBE is not a business itself, there are several SMEs and other organisations that need DBE for business purposes. If business plans can not be constructed around the DBE, it will not survive in the market environment regardless of its potential acceptance in the research domain. In that sense, the DBE sustainability plan is more than a business plan but it needs to take the business planning of all relevant stakeholders into account that do not rely on follow-on research funding but on developing business in the DBE context – mainly that of SMEs.

A Business model is the organisation's logic for creating value. It is the “glue” between business strategy and business processes. However, it refers to a single company and encompasses only a single product or market segment because of which there can not be a business model as such for DBE, for example. Also it should be noted that business models are conceptually generic but applied in different environments in different ways. In other words there is no specific business model for software industry, for example, but the generic business model concepts are applied in a certain way in software business environment. This also leads to the conclusion that open source business models are the same than business models in “traditional” software business, but the open source aspect provides the opportunity to a specific application of the business model.⁹

As mentioned above, DBE does not impose a business model. However, the SMEs that use DBE as part of their business need to apply their existing business model to DBE environment. Using DBE is a business decision for SMEs and it is entirely dependent on the applicability of DBE whether or not they can fit DBE as part of their business model or not.

In order for any software component or tool to be accepted by a software developer individual or organisation, it has to be able to do the work it is expected to do. If there are several tools available for the same work, which is often the case, the developers needs to decide, which tool is best for him/her. The choice should be based on the efficiency of the tool in a given time / cost of time x price of tool. Thus, if the tool is cheap but also time is cheap, the tool can be quite inefficient and still do its work, which is the case with for example students using unsophisticated but free software

⁹ Puhakka M. & Seppänen M. Open Source – Business as Usual?. pp32-39 in *Multidisciplinary views to Open Source Software Business, eBRC Research Reports 33, Tampere, 2006*

tools. If time is expensive the efficiency of the tool is much more important – paper industry is a good example being able to pay comparatively high salaries because the tools are very efficient.

From the SMEs' perspective the DBE environment is at the moment an interaction-aware that facilitates and speeds up the creation of solutions in networked business between companies¹⁰. SMEs considering to use DBE infrastructure compare the efficiency of the tool and time needed to implement services to DBE to other ways of achieving the same result. From the business point of view this is a crucial test on whether DBE gets accepted in large scale or not. As DBE is a research project with several unfinished parts, the tools available at the moment are not very efficient from the developer SME point of view. This is more than natural taking that the project begun only 2,5 years ago. However, this fact creates a sustainability problem to the engagement of SMEs, initiation of the developer communities and regional sustainability. The project can not rely on SMEs in regions taking over DBE infrastructure for some time, but also populating DBE with applications from SMEs is a difficult task especially when the project funding comes to an end. Project funding helps this in the short run, but it is not adequate if the SMEs don't see long-term business opportunity with the DBE. The solution would be achieving such efficiency with DBE tools compared to the time needed to learn and use them that they get accepted among the SMEs. Not because they are freely available but because they are profitable for the SMEs to use. Here, it should be noted that applying the DBE is by no means a decision free of costs or efforts for an SME – regardless of the openness of the infrastructure – instead it always demands significant investment of time and personnel resources. This investment needs ultimately to be balanced against benefits.

As another way to circumvent this dilemma regions could try to find some external funding to compensate the immaturity of the tools until they are accepted by the SMEs as they are. This would mean a transition from the initial EU R&D funds to regional or national structural funds in order to promote the further growth and technical stabilization of the infrastructure and regional DBE applications. However, this demands close alignment with regional development priorities. It will be laid out in the regional sustainability plans in more detail.

From a business perspective the key measures or steps to sustainability are the following¹¹

- 1) Further development of DBE infrastructure efficiency for the SME business environment
- 2) Demonstrated applications of business models based on utilisation of DBE infrastructure. Transfer from demonstration into real business use.
- 3) Successful nurturing of active DBE community members – Drivers and Implementers – that initiate regional communities and begin taking roles in DBE infrastructure communities for further DBE dissemination and development.
- 4) Transfer the control to the new community members from the initial developers gradually as the community grows.
- 5) Set-up of a governance organization that is accepted by the community.

¹⁰ D 5.1.1 First Assessment of the Business Domain and Integration into Unique Vision

¹¹ Applied from D 5.1.1 First Assessment of the Business Domain and Integration into Unique Vision

- 6) Growth of the community beyond public funded actions,, self-sustainability.

2.6 DBE Sustainability in this deliverable

As mentioned in the introduction, neither code base maintenance nor governance will be studied in this deliverable. As noted in the chapter 1.2, sustainability refers to the requirements necessary to permit a resource system to produce resource units over the long term. Therefore the objective of this deliverable is to **recognise the requirements and actions related to the requirements and finally point out the available resources to carry out the required actions**. These issues are predominantly approached from the **regional sustainability perspective**, as was agreed in the London meeting on March 1st 2006.

Regional sustainability is only one step towards the sustainability of DBE as a whole. The chapter 3 identifies the key sustainability issues in four layers, infrastructure, application, innovation and macro-economics. There are also identified and analysed different stakeholder groups of DBE and cross-indexed the requirements, actions and resources of these issues and stakeholders.

A case example of pursuing towards sustainability is presented in Appendix I. This particular case-example describes the evolving of sustainability in one open source project that resembles DBE from process point of view. The purpose of presenting this example is to emphasize the importance of time and subjectivity to change in such processes as sustainability in large projects.

3 Framework of Sustainability Planning

3.1 *Layers of sustainability*

From the very beginning DBE has been seen as a multidimensional and multilayered concept¹². This multidimensionality has been reflected in the design, management and operations of DBE project. Thus, it is quite natural and self-evident to think and assume that also the sustainability of DBE consists of several interconnected dimensions and layers.

In the open sustainability planning meeting of DBE project consortium¹³ a four-layer model of DBE sustainability was sketched by domain leaders Paolo Dini and Elmar Husmann based on the round-table discussion. These layers where

1. Infrastructure
2. Applications
3. Continued integration of Evolutionary Environment
4. Macro economics.

In the discussion that took place in this open meeting some aspects of these layers were identified. As discussed in the meeting, at the infrastructure layer the key issues of DBE sustainability include maintenance, stability and further development of the technological infrastructure

At application layer, DBE sustainability has to deal with topics such as enlargement to new regions and development and adoption of sector- specific vocabularies and semantics. It also deals with the integration of SME applications and services with the DBE.

Continued integration of Evolutionary Environment deals with implementation of distributed optimization, local optimization, application integration and aggregation and synchronization with emerging standards. All of these are cornerstones of the DBE vision but so far have not reached the stage of implementation in real cases.

The macro economical layer of sustainability was identified in the discussion, but it did not get explicit shared meaning in the first discussion. The point of a macro economical layer of sustainability, originally made by Mr Bertrand Dory from Intel, is interesting and will be more elaborated in the next versions of DBE sustainability plan.

The preliminary model will be further elaborated and developed during the open sustainability planning process. As the first step of this process and for the purposes of this report and next steps of sustainability planning, the following additions and light conceptual modifications are proposed to the original model:

¹² Nachira 2002

¹³ Minutes of DBE Sustainability meeting

<i>DBE Layer</i>	<i>Key sustainability issues</i>
Infrastructure	Maintenance of the code base Stability of the code base Further development of the code base
Application	Attractive service population Interoperability of services Availability of services Enlargement to new regions Legal compliance and trust
Innovation	Exploitation of future research results Contribution to standards setting Standards compliancy Application integration

We propose that within the four-layer model the third layer could be called as "Innovation" layer. That would reflect the fact that the development of the Evolutionary Environment is not the only area of innovation that should be considered in the context of DBE. We assume that there are several other areas of innovation to be considered and that the two-way connection to standardization processes is an important aspect of sustainable innovation as well

Each of the four layers has its own key sustainability issues, as tentatively listed in the table above. In the chapter 3.3., after the identification of the key stakeholders, these sustainability issues and the relationship of various stakeholders to these issues are analysed in more detail.

3.2 *Stakeholders and key sustainability issues*

The relationships between the different stakeholders and their possible requirements, activities and resources to DBE sustainability issues are presented in the following diagram as a matrix between DBE sustainability issues and stakeholders. This diagram is created by the authors of this deliverable and is merely a subjective suggestion, based on their personal knowledge and interactions with consortium members. The contents will be assessed by the actual stakeholders and the analysis of this work will be included in the next, final sustainability plan.

<i>DBE Layer</i>	<i>Key sustainability issues</i>	<i>SW developer SMEs</i>	<i>SW User SMEs</i>	<i>Regional Catalysts</i>	<i>Research institutions</i>	<i>Large company DBE Stakeholders</i>	<i>SME DBE Stakeholders</i>	<i>European Commission</i>
Infrastructure	Maintenance of the code base	Q--	q--	Qa-	Qa-	QAR	Qar	Q--
	Stability of the code base	Q--	Q--	Qa-	Qa-	QAR	Qar	q--
	Further development of the code base	Qar	Q--	Qa-	QAR	QAR	Qar	Q--
Application	Attractive service population	QAR	QAR	Qar	q--	Qar	Qar	q--
	Interoperability of services	QAR	Q--	Qar	q--	Qar	Qar	Q--
	Availability of services	QAR	Q--	Qar	Qa-	Q--	Q--	q--
	Enlargement to new regions	Q--	---	Qar	q--	Qar	Q--	QAR
Innovation	Exploitation of future research results	q--	---	Qa-	QAR	QAR	qa-	QAR
	Contribution to standards setting	q--	---	q--	Qar	Qar	QAr	QAR
	Standards compliancy	Q--	q--	Qa-	QAr	QAr	Qa-	QAR
	Application integration	QAr	q--	Qa-	qar	QAR	QAR	Qar
Macro-economics	To be defined							

Legend: Q = many requirements A = many activities R = many resources
q = some requirements a = some activities r = some resources

Diagram 1. Cross-index assessing the requirements, activities and resources between Key Sustainability issues and Major stakeholders of DBE

The diagram above represents our vision of the interests different stakeholders have regarding the different layers of DBE sustainability. In each layer, those stakeholder groups have been identified that have special requests on the issues and are expected to carry out activities and provide resources to solve the issues. Regarding DBE infrastructure there is a lot of expectations towards large and SME company stakeholders but also to research institutions and small SMEs in certain extent. Regarding the application layer, SW developer SMEs and regional catalysts can be counted on. The innovation layer relies on research institutions and EU to carry the main responsibility of sustainability.

It should be noted that many stakeholders have requests and needs regarding many different aspects of DBE. Those able to take actions and have resources for those actions are much scarcer. There should be found a balance between large number of different requirements from different kinds of stakeholders and the actions that can be done and the available resources.

The preliminary round of analysing this diagram has been conducted in the business domain meeting in London on May 8th-10th.

3.3 *Aspect of time*

Time is a crucial factor in sustainability planning. If DBE sustainability would be on the stage in which DBE is at the moment, the future of DBE would be very short. As the future development of DBE technologies, business applications and communities using DBE is taken into account, the perspective widens enormously. However, as the possibilities increase, also the elements of risk and uncertainty increase respectively.

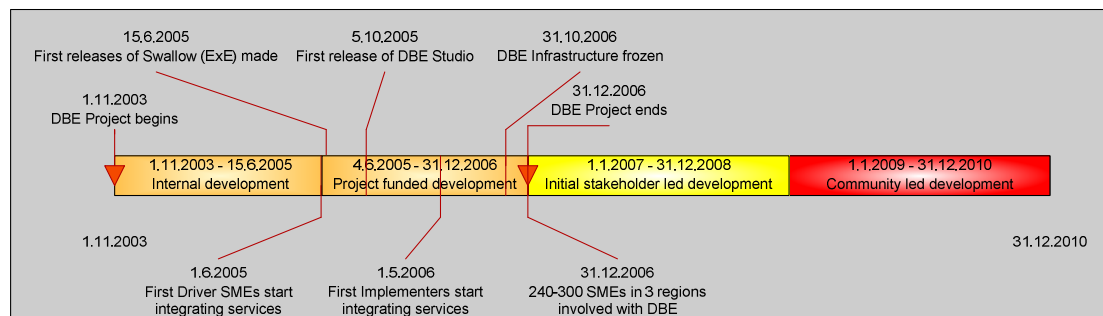


Figure 4. Suggestion of a project development timeline

The figure 4 suggests that as the first releases of DBE tools are at the end of the project just 1½ years old, it will take at least two years of development that is required to be led by the initial developers. At some point the community is ready to take more responsibility in this. This timeline is still rather optimistic – five years from the beginning of development to a community led group of open source projects. This is a matter that requires planning by the existing developer community and will not be pursued any further here. This is a crucial part of sustainability, however, and it will be worked in cooperation with the computing domain for the final sustainability plan deliverable.

4 Regional sustainability plans

Digital Business Ecosystem is not an abstract entity that works automatically in the internet helping SMEs enhance their businesses. As discussed in the opening chapter, Digital Business Ecosystem means rather different things depending on the point from which it is looked at. It was also stated that this sustainability plan is created from the regional point of view, while also addressing the links to other approaches to DBE sustainability. This chapter presents the regional sustainability approach and initial regional sustainability plans of the three regional catalyst regions.

Regional sustainability of DBE refers to reaching a sustainable position in a specific geographic region for a group of DBE stakeholders active in the region. The regional catalyst approach was chosen to be the way in which DBE was to be tested and implemented in different European regions. Regional sustainability is the first step towards sustainability in whole Europe. Initially the regions will pursue towards sustainability in their own regions after which the interregional collaboration will provide new dimensions to DBE and bring the DBE features to their full extent. Regional sustainability is not independent as for example DBE infrastructure is not developed in the regions. Regional sustainability plans have thus strong relationships, mainly through the regional catalysts, to other stakeholders in DBE.

4.1 *Regional approach to sustainability*

DBE is implemented in different European regions. Initially, these regions are presented by the three regional catalyst regions of the project, Aragon Spain, Tampere Finland and West Midlands UK. Each region has (and will have) their special characteristics that affect the way DBE can be sustained in the region. In the following sub-chapters the regional sustainability plan drafts of the three regions will be presented.

In the final sustainability plan – also new regions will be taken into account that are currently in a process of getting closer involved with the project and setting their agenda for sustainability.

First, the regional setting is presented from the sustainability plan point of view. There are major differences in the organisational form and funding of different regional catalysts as well as their positioning in the regional economy. Also, the SMEs in the regions differ and their needs regarding DBE can be very different. Finally the regional policymakers have taken different positions regarding DBE in different regions. Next the requirements for each region regarding sustainability are described. Then the actions based on the requirements are presented. Finally the resources available in the region to carry out these actions are listed.

An initial list of sustainability requirements – from a regional viewpoint - were listed as a result of a brainstorming session in the London sustainability meeting in March 1st. The requirements are presented next under the topics of technology, training and communication, financing and community building.

- **Technology**

- A roadmap – where DBE is going to in terms of technology
- Code base maintenance
- A functioning, stable, secure platform (good enough)
- Code contribution process
- Release management process
- Supporting different SW development methodologies in DBE
- Process of ensuring DBE service/application interoperability
- Technical documentation
- **Training and communication**
 - A common interregional website / A platform of collaboration
 - Proven business benefits / success stories for SME developers
 - Collection of DBE applications / business solutions
 - Demonstrations
- **Financing**
 - Funding
 - Integration to regional and national funding
- **Community building**
 - Community identity building
 - Support community
 - People making services on DBE
 - Identification of different roles that are needed to be played in regions
 - An address – where is DBE
 - Profile of expertise and interregional services

4.2 *Tampere*

4.2.1 **Regional setting in relation to sustainability**

As Finland is a rather small country, in DBE related operations Tampere region has been collaborating with Helsinki region and other major growth centres in Finland. DBE software environment requires quite sophisticated understanding on software and - at its current stage - rather specific business interests. In order to pilot DBE in Finland restricting the SMEs geographically to Tampere region would have ruled out many potential DBE Drivers and Implementers. Furthermore, Finland is homogenous in the sense of software developer SMEs, especially related to open source and that also supports the enlargement of the geographical region.

In Finland, DBE was “sold” to the SMEs and policymakers initially as an EU research project on advanced software development. That approach did not yield very good results in terms of rising business interest. Based on the first feedback from leading software providing SMEs – some of them suggesting Finland to resign from EU because of this kind of projects - the approach was changed towards emphasizing the open source dimension of DBE.

The national Centre for Open Source Software of Finland, COSS, is operated by Technology Centre Hermia, the regional catalyst of DBE. COSS supports the adoption of open source software in Finnish industry and the growth of Finnish open source businesses in the global market place. More specifically, COSS aims at:

- ❑ Creating innovation networks of global corporations, local SMEs, developers and end-users.
- ❑ Making Open Source products, services and solutions familiar in different industries and user groups.
- ❑ Enabling the growth and internationalisation of OSS businesses.
- ❑ Organising high-quality and international joint research and development projects with research institutions and corporate partners
- ❑ Linking the Finnish Open Source business ecosystem with international networks and partnerships.

Integrating DBE as the flagship research initiative of COSS was successful. Even though DBE in itself does not technically or philosophically require the software developers to use open source software as DBE services, that proved to be the case in Finland. Many proprietary software and service developers were approached, but they were too cautious regarding the maturity of DBE software to get involved. Instead, several promising open source software developers saw value in early participation of DBE community and good results were gained.

In Finland the SMEs engaged in the first phases provide business-to-business tools to their customers. Pieces of project management software were the first ones to be integrated in DBE. It was foreseen that the more SMEs and software applications were to be integrated in DBE, the more all software developers participating would gain in using DBE environment. For this reason there was from the beginning a very good spirit towards cooperation within the Finnish DBE developer community. Also, COSS was the uniting factor between the SMEs and the networking between the SMEs was very good from the beginning.

The regional catalyst was seen as the coordinator of trainings, responsible for the engagement of further SMEs, provider of development funds for the initial integration projects and the link to the other partners of DBE project. As the project funding is coming to an end, it is understood that the funding and most training will also come to an end, but at this point it is very likely that there is a strong need for regional catalyst activities. At present, none of the SMEs is willing to take over the leadership over Finnish DBE community, which is understandable as they are small companies with their own business interests. Also, the developer community is still rather small and even though the number of engaged SMEs is likely to increase substantially before the end of the project, it is inevitable that the SMEs need guidance from the regional catalyst and other project partners involved in DBE after the project time.

The availability of additional funding from regional resources is a crucial concern in DBE sustainability. The main parts of the Tampere region are included in Objective 3. This means that the availability of regional funds to product and infrastructure development is very limited and the main target of public funding is competence development. To DBE this means that the engagement in Finland is market-driven rather than policy-driven.

4.2.2 Requirements

In this chapter the most important requirements for regional sustainability in Tampere region are presented in regards to technology, training and communication, financing and community building.

DBE consists of several open source projects and even though most Finnish SMEs are accustomed to working in different OS projects, it is unlikely that there will be adequate amount of developers coming from the SME side for many years to retain the development and take up the support activities for the different projects. For the SMEs, however, the most important concern regarding DBE sustainability from technology side is the maintenance of the code base of DBE infrastructure even though they are not able to contribute much to support it themselves. DBE projects are quite large and maintaining the code base alone is a large task that needs a lot of attention. Also, a broad view of DBE roadmap on the development side is requested by the SMEs. Maintaining the interoperability between the different DBE OS projects is very important and difficult for the RC or the SMEs to influence on. Also transparency in code contribution process, release management and technical documentation is highly desirable. The technology side of DBE sustainability presented here are requirements that are very difficult to fulfil by the regional actors and that needs to be paid attention in planning the sustainability of the entire DBE project.

In regards to training and communication, more requirements can be met by the regional activities. Clear presentation of DBE documentation and training modules for SMEs and other stakeholders that are interested in DBE is very important. The whole idea of DBE needs to be clarified to different audiences as well as possible. There is need for an interregional website that is regularly updated and provides the paths to different DBE resources as well as regional website that provides more down to earth information on the regional community activities. These websites need to be closely integrated, naturally. Training from the main part is going to take place using different self-learning training modules. As has been seen during the project, the need for individual training is continuously great and the regional sustainability requires a mechanism to provide this sort of training in addition to self-learning. For example driver SMEs could provide training – for a fee – to other SMEs interested in investing to DBE. The induction part of DBE training is crucial in order to attract further SMEs to participate in DBE community and presenting clear demonstrations on different proven business cases and collection of existing DBE applications helps this remarkably.

Funding is the problem for almost all SMEs. As the EU funding is ending for the SMEs as well, different sources for funding the future activities need to be sought in the region. Where possible, national funding should be applied for and regional catalyst has an important role in this as they can represent DBE as a whole. Different activities requested here can also be integrated as part of other projects and activities taking place in the region and those opportunities need to be addressed.

Community building is the most demanding task in all the regions to do. It is very difficult, if not impossible, to *build* a community, but there are many things that can be done in the region to support the community to grow. DBE community both in the interregional and regional level need to be given an identity and a brand. The people participating in the community should be recognized by developers and other individuals. Also the community should support different roles in both regional and interregional level. Furthermore, the difference in belonging to the “Global DBE

community” or the “Tampere DBE Community” needs to be differentiated. One can be a minor contributor in global community but a major actor in regional community and vice versa.

4.2.3 Actions needed

As mentioned in the previous chapter, most technology related requirements are difficult to address from the regional level and they need to be solved by other means. In Tampere region the need for a regional catalyst is imminent and TCH will carry out this responsibility as well as it can. As TCH is financed by public project funding financing is naturally a problem, but many activities can be taken as part of other projects and programmes of the company. Communication tasks as well as putting up a DBE user group can be done by TCH. Training coordination and provision can also be done to some extent by TCH as well as seeking national funding for DBE community participants.

SMEs are requested to be active in the community building and they are expected to do so as they benefit from it themselves. However, it is not likely that the SMEs will provide much contribution to DBE infrastructure as their business interests lay elsewhere. Ideally DBE provides an ecosystem in which seasoned SMEs can provide support activities using their own business logic to newcomer SMEs and the need for outside intervention decreases gradually. This is expected to take several years, however.

The acceptance of DBE within the policymakers has not been an easy objective to reach in the Tampere region. DBE is rather difficult to comprehend by anyone not closely following the recent activities happening in the software development industry. For this reason DBE message to the policymakers needs to be simplified and regional and national benefits of it emphasized. The policymakers can provide sources to funding and participation in new initiatives if DBE would be accepted more widely within them. Currently DBE is accepted in the Tampere regional ICT activities as the main players come from TCH. On national level the message has not yet gone through in most places.

4.2.4 Resources

TCH will most probably continue its role as regional catalyst of DBE after the project ends. The main resource for this will be COSS, not in providing funding but providing visibility and reliability to DBE and social networking to participant. COSS will organise a specific DBE User Group, where DBE services providers can exchange their experiences and stay connected with progress and actors elsewhere.

In terms of research projects and innovation the main tool within COSS is FILOSI, *Finnish Linux and Open Source Initiative* -forum for software research institutions and companies. COSS is one of the founding partners of FILOSI and that provides the best access to gaining acceptance for DBE in the national level within companies, research institutions and policy makers such as National Technology Agency TEKES.

It is also worth mentioning that a dedicated open source competence development project *OPERET (Open Source Region Tampere)* has been recently launched. That project, funded by the regional Employment Agency and coordinated by TCH, can be used to provide some DBE related training and business activities for companies in the Tampere Region.

TCH is also participating PEARDROP Specific Support Action -project that is part of the Digital Ecosystem Cluster. Activities in PEARDROP also benefit DBE as the aim of the project is clarifying, disseminating and promoting the results of regional DBE deployments and related FP6 projects and raise awareness of DBE in many regions targeting especially to policy makers.

The SMEs engaged in DBE are expected to use DBE platform in their own business activities as they see it best. They are expected to be mostly self supportive

4.3 West Midlands

4.3.1 Regional setting in relation to sustainability

The software development industry in the West Midlands region of the UK is at an intermediate stage of development. The level of expertise in the region's software business could be characterised as a normal distribution in which only a few 'driver' firms have been located as ready, willing and able to join DBE on current terms and conditions. The regional catalyst has sought SME recruits from elsewhere including the south-east of England and the East Midlands region-where a network of SMEs called EMNET has been located that may provide the necessary platform for DBE growth. At present our approach is to create a service using the combined efforts of our software developer SMES and make it available to EMNET for testing and implementation. The advantage of this approach is that provides a sizeable prototype for DBE platform without exposing single SMEs to undue business risk. The choice of service may give clues about the next stage of development for DBE services and provide a convincing rationale for new SMEs, industrial sectors, and regions to join the innovation ecosystem in later years. Some SMEs appear from their comments to have started to realise that they can create and adopt roles in DBE as providers of services and functions to DBE as whole in addition to their business services. Similarly networks such as EMNET offer a ready to use test bed for such SMEs to work with.

During DBE project we have sought alliances with a number of regional agencies, each of whom has a strategy that could be connected to DBE or one of its spin-offs.

The open source software 'community' is an example. Open Advantage is a practically inspired project designed to increase the commercial uptake of open source by small businesses. DBE and Open Advantage have to some extent a similarity of focus in seeking to assist business change in this way and to actively pursue related research. We have also made links with a regional development agency, Advantage West Midlands and been involved in their briefings to those concerned with IT in the region. One of the outcomes of these consultations is an opportunity to bid for funding to support the sole trader businesses in the region with a skills and services project. DBE would provide a basis for doing this in that DBE has seen us progress our thinking about future business models.

A third strand in our thinking and action has been research. As a regional catalyst our primary role has been to facilitate the recruitment and development of local SMEs to the project. But out of our participation in DBE we have been able to continue our research interests in some theoretical aspects of business ecosystems. We have formed a knowledge technology group from previously separate staff groups with an extended range of skills in computing and business management. For several years now our interests in aspects of the knowledge economy have flourished and been extended with the arrival of new staff with their own interests. Individual and group research within our university faculty is then one strand of our plan. Another is to enable research into companies using means such as knowledge transfer partnerships. These place university staff holding specifically useful expertise within companies who can benefit from the application of those skills in their business.

As a university we are in a good position to provide a range of means to sustain aspects of DBE such as being part of DBE network by having DBE nodes within our IT system; relating ecosystem thinking to business strategy through several of our courses aimed at entrepreneurs-especially at post-graduate level; being part of regional development networks such as associations of universities and ICR agencies concerned with local economic growth; applying for funding from European or other sources to pursue growth opportunities. We will consider joining networks of excellence for example that will keep us in touch with people who share our interests and have suitable approaches.

Other providers of DBE services besides the current regional catalyst need to be found. This is because, as a project with such a strong technological component, the scope for a Business School is perhaps better seen as a niche role typically concerned with facilitating SME involvement in innovations, providing related educational services, and studying impacts at a theoretical level.

Moving up from the level of School/Faculty the university has a whole may play a wider role in developing digital business thinking in the regional economy. By drawing on expertise from across relevant faculty groups, along with associated business and institutional contacts, can relate a number of subsidiary IT projects such as the exit phases of Open Advantage and DBE by re-grouping personnel and other resources behind a unified agenda for innovation.

4.3.2 Requirements

The ideal requirements for sustainability in the West Midlands would be a convincing demonstration of the competitive advantages of adopting DBE approach from the viewpoint of each stakeholder concerned. During the past phases of the project we have seen the use of number of supportive arguments used to justify DBE to decision makers such as membership of a social network with access to the latest thinking; being in at the beginning of a new way of doing business; being able to innovate in your business's portfolio; strengthen your regional economic policy with DBE platform. After a time these messages are reduced to more practical rationales for participation under the exigencies of economics and project timelines.

At the moment the investments and benefits, the skills, knowledge, responsibilities and risks of DBE are quite clearly defined and delimited. But as we leave the safer

waters of a project and enter the open sea of commercial life, it is likely that new demands and constraints on each player will become active: loss of key staff; alternative pressures on existing staff; loss of expertise to alternative projects; lack of funding; inadequate responses from key players; lack of time to fix the problems or even lack of a remedy.

Sustainability requires that the technology of DBE and the expertise required to maintain and develop it remains accessible to the regional catalyst in an economic and organisationally acceptable form. The current European integrated project format might be continued, or the catalyst could adopt a mix of other approaches such as networks of excellence through bids for FP7 funding or partnerships with funded institutions.

SMEs will need to address the question of their next steps when they have completed and consolidated successfully their project subsidised developments. They will by that time have a sense of suitable opportunities, likely pay-offs, risks, and relationships that they can form with others in DBE community to make their offer workable. This is in part then a matter of readiness and timing.

The University may wish to consider a combination of stakeholder roles and positions that it can enact itself or assist others to enact. This means that we will need to understand changing needs from the viewpoints of SMEs, RDA, city council, Chamber of Commerce, IT associations and several 'parallel' projects and take a relevant role with respect to them.

Alongside institutional commitment of this type, the open source software community appears to evolve rapidly and well when highly motivated individuals have the time, funding and space to act with relative independence. Universities are traditional what we might call person cultures and in this case it may be apt. key individuals are able to connect with networks of like-minded people and make rapid strides that take bureaucracies much longer to achieve and at higher cost. To some extent individuals may require the support of large companies and others to provide a resource base such as a technology platform but given that can make it work.

The immediate priorities are for the SMEs and developers that were initially recruited to the project. There is a great need for them to continue to be supported financially and by the DBE research team including 'codebase' maintenance and training. This support will be needed while the DBE continues to grow, and until the DBE has reached a critical mass. Without the continued support both the SMEs and the developers are likely to walk away from the project.

There is an important need for more marketing of the DBE project in order to 'spread the gospel'. This is important in order to ensure new SMEs and developers are recruited to the DBE without which the DBE will never survive. Further recruitment of both SMEs and developers is needed both in the currently active domains and in new domains, particularly manufacturing.

Developers and SMEs need a clear indication of where the DBE is going and how this is to be achieved. Unfortunately until the final sustainability report is produced they are still living in hope rather than seeing clear facts.

4.3.3 Actions needed

We wish to maintain the early development of DBE services and prove its functional worth in a quasi-commercial setting such as an IT network or association undertaking an application as a practical research task together. Commercial pay-off would in the short – term be secondary to technical proofing (can we make it work?). Success in a small practical area might well catalyse the attitudes of SMES who will be more inclined to act themselves if they see role models benefiting from their participation in the project. This will constitute development by drivers with implementers in a larger network e.g. of 30-50 companies. We will connect DBE companies with those doing other projects to seek mutual gains. We will continue to support other regions in their efforts to adopt DBE.

We need to continue to work towards the development of local policies and strategies that support DBE. This means continuing dialogue with policy makers who can see benefits in DBE and can provide direction and resource that constitute an organizational footing for further work. It is likely that we will need to recruit several organisations to achieve this, since each gains its strength from its capacity to influence and relate to the needs and actions of the other, as in a tripod. So a large company, the regional development agency and one or more universities might have the combined strength to achieve some impact.

A survey of stakeholder opinions about DBE at the appropriate time would offer a basis for seeking commitments to a post-project DBE establishment such as a DBE Foundation. A gradual approach to this consultation has been in operation almost since the inception of DBE project; as we reach the end of the project, we are better able to see what we have achieved and what exists in the form of practical commitments, effective demand for services, skills and knowledge that can sustain growth and innovation.

Given the fragmented nature of the national institutional framework in England where no one government department controls the whole system, we wish to make approaches to policy makers in several areas where we feel there may be some chance of obtaining support. In a similar manner we will seek the support of our local European representatives.

Our plans assume that key individuals will be maintaining their individual research activities on DBE related topics after the project.

Continued financial support is essential for the current SMEs and developers. This funding may be needed initially from the policy makers although Regional catalysts like RDA are being actively encouraged to participate and to assist with funding.

Further development of application software is necessary by the developers to enhance the functioning of SMEs within the DBE. Such development will help to

encourage more SMEs to join the project and hence move the project towards its critical mass. The SMEs need to further their relationships with the developers to ensure the software is available and meets their requirements. RCs can be used as a catalyst to help the process along.

Recruitment of more SMEs and developers is essential. To this end the UCE team is looking at ways of marketing the DBE within the West Midlands and as part of this marketing strategy will be arranging further recruitment days. In addition talks are being held with regional advisory network teams to encourage their assistance in finding new SMEs and to assist in the funding.

The ‘codebase’ of the DBE will need to be supported for the foreseeable future in order to iron out and difficulties that arise as more SMEs and developers are added and as new technical innovations arise. This will need to be supported by the policy makers.

4.3.4 Resources

Our aim is to seek interim funding from a range of agencies when DBE project has been completed in order to sustain the regional catalyst role. Some of our required funding will be sought from European projects and some from regional funds dedicated to economic growth and innovation, or to building capacity in local enterprise networks.

Both SMEs and agencies such as ourselves may wish to consider some sources of income e.g. from hosting community building events such as a meetings, exhibitions, conferences; facilitating web based contacts e.g. web logs, or from providing research, development support in company, consultancy, qualifications and training. Were these sources of funding not forthcoming it is unlikely that the University would be in a position to sustain DBE.

Currently the resources available are:

- The UCE project team which can support the SMEs and developers with training, and help and advice on BML.
- The SMEs and developers who can, and do, provide essential feedback on how the DBE is performing. In addition they also provide feedback on what needs to be added to the project to improve its operation and therefore its sustainability.
- The SMEs and developers who provide domain expertise. This is useful when new SMEs are recruited from within the same domain.

The following resources are needed:

- Further SMEs and developers to help build towards the critical mass that is necessary for the DBE to be sustainable.
- Training support for the current SMEs and developers.

- Regional support agencies need to be convinced that the DBE is viable and worth supporting financially.

The plan for acquiring the resources includes:

- Building a marketing strategy for the DBE.
 - Recruit new SMEs within existing application domain areas.
 - Recruit new SMEs and developers from new application domain areas.
- Running SME and developer training workshops.
- On-going negotiations with regional development agencies to assist with funding.
 - For the continued support of existing SMEs and developers
 - For support of new SMEs and developers to the DBE.
 -

4.4 Aragon

4.4.1 Regional setting in relation to sustainability

The business climate of DBE in the Aragon region is becoming very good. The training strategy has been followed and the results obtained are even higher than expected.

Thanks to the training activities, in the first phases of the project (first one year and a half) mainly through the one-to one meetings to the key actors of the region, DBE started to have a positive atmosphere around it which was the intention we followed.

Regarding the policy makers, we consider them as a key agent since the beginning of the project. We found the exact department of the Government that would fit and understand the potentials of the project (DGTISI – the General Direction of Information for the Society Technology of the Aragon region - www.aragob.es) and that's why we had several and continuous meetings with them since the beginning of the project, explaining them the potential impacts of the project in the regional SMEs. We worked with them in integrating DBE into their strategy in the period 2005-2008 and the first important result is that they are funding Phase II Implementer SMEs (http://www.ita.es/dbe/lib_asp/binarios.asp?TABLA=_DESCARGAS&ID=131) with 145.000 euros and they have already planned to fund a Phase III with 55.000 euros in June-July 2006.

Regarding the SMEs, most SW developers understood DBE concepts since the beginning. This knowledge has been highly reinforced by the fact that the code generated by the project was released and then installation manuals and service examples have become available. These facts have made DBE platform to be "closer" to the SMEs. The consultancy study made in the beginning of the project to select the first sector to apply DBE technology (namely, the tourism sector) was very important because it has helped us to show how to apply DBE technology and now it is helping to show the first results in a real business case (www.ita.es/dbe "Drivers" section).

The majority of the SW Developers in the Aragon region are already aware of DBE project due to the big events organized and to the respect and influence that ITA has in the technology companies of the region. 4 of them started to work as Drivers, they

have finished the development of DBE connectors and they are already planning the installation of the updated DBE applications in real final Users which are using the corresponding tools in their day life. 17 SW Developer SMEs applied to become Phase I Implementer SMEs. Then, it may be seen that SMEs are very enthusiastic with DBE technology are willing to participate in it.

DBE is also another way to make SMEs to work in network which is something that ITA, as a Regional Catalyst, is also motivating even with other projects. Some SMEs have already met because of DBE and they have take advantage of those meetings for doing other businesses.

Our **vision** about the Sustainability is that The Products/Tools developed in DBE project must be used by as many Organizations/People as possible. In that way, those SMEs exploiting DBE in the long term will be the first interested ones to sustain, maintain and evolve DBE platform. Then, in the short term we have to execute the corresponding actions to achieve the long term view.

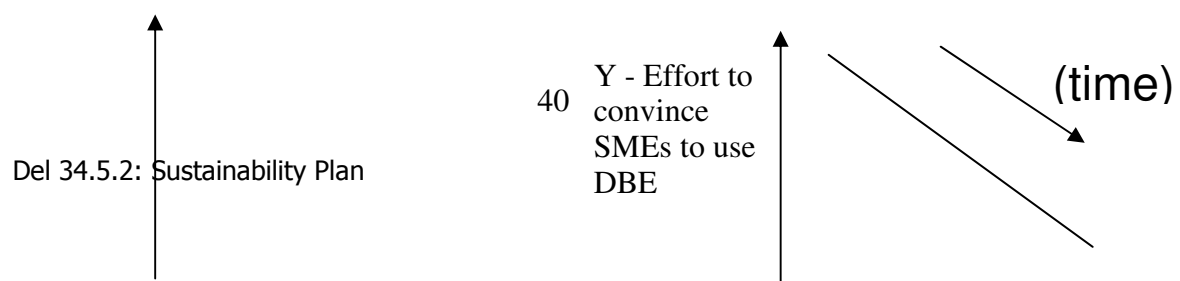
Some objectives derived from that vision are:

1. To gain the support of the Government, not only from a funding point of view, but also from a “spiritual/connotation” point of view. The Government needs to see that DBE is interesting for SMEs and then the Government will go on supporting it.
2. To get code maintenance somehow (in the action section it will be explained the required realistic actions). If the “critical mass” is reached, then everyone will maintain the code for their own interest, but in the bootstrap it is needed to make SMEs have services and products over the platform. But we think just after the project is finished, there will no be that “critical mass”.
3. To get as many services available over the platform as possible, then it will be easier to get more people working on the platform, and then the more services will be. Again, the bootstrap is the key point.
4. To get good and practical training materials.

From a practical perspective, it has to be taken into account that SMEs do not normally have a lot of resources to spend in not-funded Research, so one of the important points is that they are going to try to use DBE with a commercial and business perspective as soon as possible.

In DBE platform, it must be distinguished between the business part of DBE and the R&D potentials of DBE. On one hand, at the end of the project DBE will have some parts which have been totally stabilized and are very robust. The objective for those parts of DBE is that regional SMEs make projects which are exploited from a business perspective. On the other hand, the platform offers a great potential to introduce new R&D concepts into it. Then, if there are some gaps identified in order to be able to exploit a new business case, then it may be presented to a competitive funding program.

Another aspect which we should take into account is the following. The more features and the more stable the platform, then the less background reinforce (extra-funds, the Government support, the foundation, business case explanations ...) is needed to make then participate and use DBE.



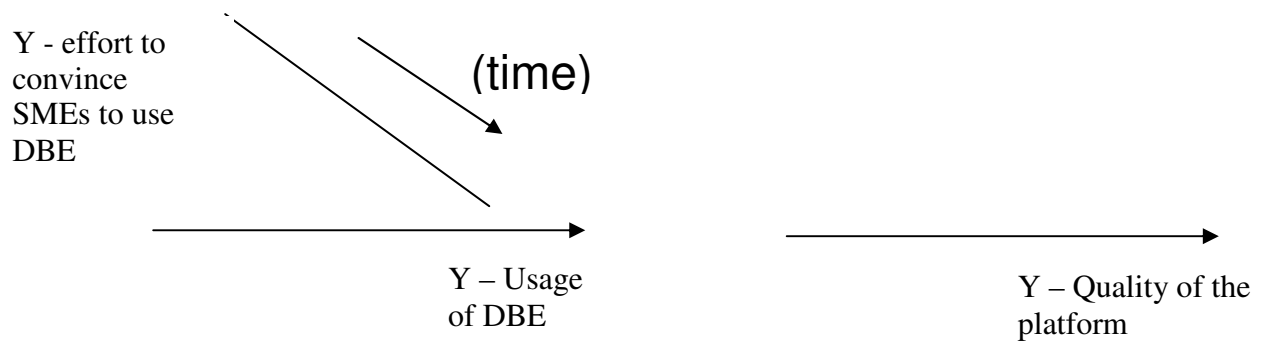


Figure 5. Need for effort to convince SMEs to use DBE

4.4.2 Requirements

In this chapter the most important requirements for regional sustainability in Aragon region are presented in regards to technology, training and communication and financing.

Regarding the technology, it is important to have the highest number as possible stable and robust features in DBE Technology. The immediately question which arises is, which is that number? The answer depends on every specific SMEs. Depending on the profile of people working on those companies, their requirements will be different. It may be found a developer SME which high knowledge of java, with a high tradition in the Open Source Philosophy, with a RRHH department which allows this kind of projects so that the employees are happier in the company, ... that will start to work on the project although the platform is not very stable yet, and then it is not possible to do business immediately. However, it may also be found companies that will not work on DBE unless the technology has a high number of stable and robust features where these SMEs may make business immediately. Then, the higher that “number”, the higher the SMEs that will have a “threshold” to start working on DBE.

The code developed in this project is huge, so it will be desired to have a small group of people in the first months after the project ends that not only provide support in order to correct bugs, but also will teach how to find those bugs in the middle of that amount of lines of code. The roadmap of DBE Technology is also something requested by SMEs.

Regarding training a communication, SMEs already engaged request to have service examples to show the usage of every feature. At this moment, it is still difficult to create stable documentation about services since the platform is still under development. The Induction documentation and videos are more stable since the general concept is already fixed.

As it is explained in the resource section below, it may be that the funding needed in the next future after DBE project ends is obtained without many difficulties. At this moment of the project the funding is not critical since Aragon has obtained additional funding (exactly the same funding as the European Commission has provided) from the Government of Aragon, and we are receiving more applications than needed to reach the objective numbers planned in the training strategy.

4.4.3 Actions needed

There are some general aspects on sustainability already discussed previously in this deliverable which are common to all the regions.

In order to reach the objectives proposed in section 4.4.1, it is explained below some actions which have been taken and some actions which will be taken:

- The recruitment of 4 Drivers.
- The recruitment of the Implementers Phase I and Phase II. 17 SW Developer SMEs applied for the Phase I and 8 SMEs have started to work in the project. 13 SW Developer SMEs applied for the Phase I and 12 SMEs have started to work in the project. There will be a third call where 4 more SW Developer SMEs will be engaged.
- Make drivers use DBE in other projects they are involved. Indeed, we have already applied for the Spanish national PROFIT R&D Funding Program 2006 for a project called TUR-INTEGRA together with other regional and national companies with a budget of 1.359.759 euros.
- Use the networks of the organizations already involved to disseminate DBE. Following the idea of the previous item, the objective is that SMEs which have already participated in DBE create proposals for new R&D projects together with other SMEs which have already participated and other SMEs which have not worked yet with DBE Technology.
- Make other DE cluster projects use DBE platform. We have talked to members of the projects of SEAMLESS (Antara) and Envision (LABEIN) and we have met them to show them the platform in our facilities from a practical point of view on March, 28th. We have shown them the work done by Drivers, too. They are evaluating at this moment whether to use DBE platforms or parts of it. The feedback we have received is very positive and they are now convincing their project partners to use DBE.
- Make other regions participate in the project and use the platform. Several workshops are planned in new candidate regions, such as Trento and Extremadura in the short term.
- Try to participate in new projects based on DBE Technology at national/international level. Most of us can't provide funding directly, but we can organize projects based on DBE Technology together with other DBE partners, but also other partners.
- Make scholarships work on DBE in different organizations.
- DBE has been integrated in the DGTSI Department of the Government of Aragon in their Director Plan 2005-2008. The DGTSI is funding the Phase II of engagement of SMEs with 145.000 euros and will fund a Phase III with 55.000 euros.
- Try to integrate with other OS Initiatives like JBOSS. We have contacted certified JBOSS partners (there are two in Spain) and we are planning an event together.

4.4.4 Resources

From our regional perspective, at the present moment we consider that the best way to obtain resources from a realistic point of view is the way we have already proposed in the previous regional section:

- On one hand, for the stable and robust components of DBE (mainly those which provide system integration of technologies), SMEs will make projects for companies that will pay for them.
- On the other hand, for the new technology concepts to introduce in DBE, a consortium of experts may be created to apply for some regional/national/international competitive funding programs.

Additionally to that, ITA may not fund directly SMEs, but ITA can influence the Government to provide specific funding for Technology Solutions for specific vertical sectors based on DBE technology.

In the future, when DBE Technology is widely spread, then it will be possible to organize courses/training about DBE Technology where SMEs pay for attending, but we do not consider this may be a resource source for DBE in the short term.

4.5 *Conclusions on regional sustainability*

The three pilot regions in DBE are all quite different, which can be seen from the regional settings. The regional settings can be illustrated by the following figure:

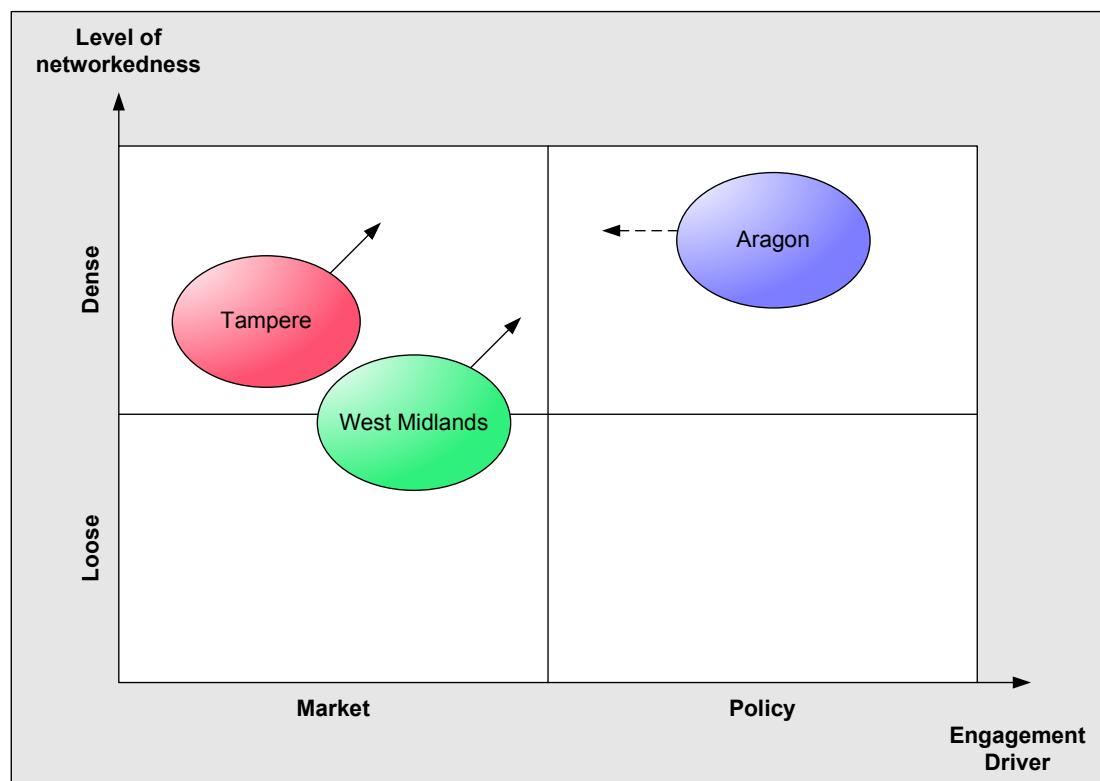


Figure 6. DBE pilot regions in the axis of networkedness and engagement driver

Based on the availability of regional funding and commitment of policy makers, Aragon has been able to implement a policy-driven engagement strategy. The arrow

points towards the market-driven area, because in order to find a sustainable model for the DBE in the Aragon region, SMEs need to find market incentives for the use of DBE, which was described in the Aragon regional setting. Also, Aragon has been able to create a close network between the Drivers and Implementers participating in DBE.

West Midlands and Tampere have had to rely purely on a market-driven engagement strategy. This means that SMEs – even though receiving support funding through the DBE project – could not been offered the perspective of stepping into a technology development program with strong regional policy support and perspectives for follow-on structural funding. In that sense, they had to rely on the near-term value of the project outcomes for their application cases.

A policy-driven strategy might have been easier in an R&D project, because it would have helped in the phase where the actual “DBE product”, the infrastructure has been incomplete. Initially, that has not been a possible option in Tampere or West Midlands because of the available funding instruments and the regional setting with policy makers. However, the movement in both regions is slightly towards policy-driven engagement as there are plans for linking DBE as part of other policy programs and find funding and acceptance that way. Also networking is supported strongly with for example blogs, one-to-one meetings and workshops involving SMEs.

In Tampere the fact that DBE is based on open source software is the key ingredient to DBE success. Tampere regional catalyst is a Technology Centre with informal rather than formal position in the Finnish software developer community. COSS being a widely accepted centre for open source provides also DBE, however, much better acceptance within the open source companies than if it was being supported for example by the local government. University of West Midlands is the only university acting as a regional catalyst. UCE has a very good position to add together the empirical experiences of regional catalyst activities and theoretical research on digital ecosystems. The results from this will prove to be very valuable, especially in longer term. In West Midlands and in Tampere the geographical area has been experienced to be too restricting and SMEs have been sought from a wider area than just Tampere or West Midlands region. Aragon has from the beginning approached DBE from the policy makers’ perspective and has excelled in recruiting SMEs with that approach. They are also the only region that has been able to attract additional funding for SMEs due to their approach. The funding possibilities also in the future are very bright in Aragon, which helps also in reaching to sustainability in the future. In all regions the business aspect of DBE has been perceived very important. From the regional sustainability perspective the pragmatic fact is that DBE is only as good as it is perceived by the SMEs. Sustainability of DBE is not only SME sustainability but from the regional actors’ perspective the DBE as a tool for making business is the key with which long term sustainability can or cannot be reached.

The regions have identified the key requirements, actions related to the requirements and resources available for executing the actions. These are the fundamentals for the regional sustainability plans that are required in order to the DBE to stay alive in the regions also after DBE as a project has ended. For other regions planning sustainability any these plans is not necessarily perfect, but being rather different they should provide ingredients for creating a sustainability plan to quite a variety of regions.

In deliverable 31.1 Analysis and specification of current and potential regional catalysts was presented a business model for regional catalysts.

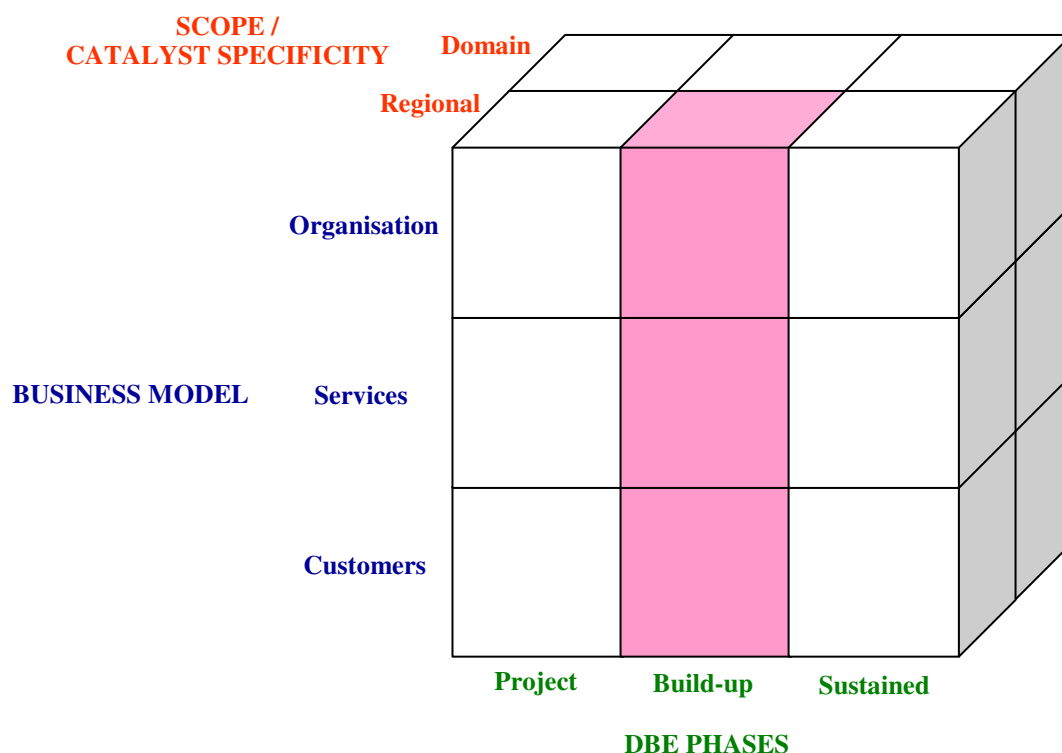


Figure 7. The Concept of Regional Catalyst in the DBE¹⁴

The model suggests that regional catalysts, which are the key players in the regional sustainability context, need to consider their

“Scope” and “DBE phases” set parameters in which the regional catalyst concept can be defined: the DBE phase is either in 1) project phase 2) build-up or 3) sustained and the regional catalyst scope is 1) domain specific 2) regional specific. At the moment we are approaching the build-up phase in the regional specific scope. This also corresponds to the phases 3 to 4 of the regional engagement planning.

In contrast to this, the parameters of the third axis change with regard to the two other axes: e.g. target customers change with regard to the scope and DBE phase and the (optimal) service range changes with regard to the scope and DBE phase. The optimal values of the parameters on the business model axis also change with regard to each other: e.g. services vary according to the target customers. Each of the parameters of the business model axis also needs to have values at the same time: a regional catalyst must have a set of services, target customers and a model for organisation. Thus regarding cause effect relations, the DBE phases axis is the primary dominating axis, the scope is secondary dominating (scope is dependent on the phases) and the business model is the most dynamic (all of the parameters of this axis depend on the two other axes).¹⁵

In the future the scope will widen also for regional catalysts further from the domain scope and the DBE phases will not end when “sustained” has been reached. Instead,

¹⁴ Applied from D 31.1 Analysis and specification of current and potential regional catalysts, p 41.

¹⁵ D 31.1 Analysis and specification of current and potential regional catalysts, p 41

the evolving of the business plan is constant for regional catalysts as well as all other stakeholders of DBE.

This indicates that “sustainability” does not describe a single stable state. In fact, what is the main concern of “sustainability” now is the survival and further growth of the different DBE activities after the end of the funded project time. What is most likely at the current stage is that the project is approaching an intermediate phase where regional or national funds are used to carry the DBE into new regions as well as develop the pilot regions further. This goes in line with a further development of the DBE technology solution partially already by the SME community (with regards to applications) and partially by the initial stakeholders (with regards to the code base). This intermediate phase could be called “sustainability of the DBE initiative” and corresponds to the phase 5 of the engagement strategy.

The longer perspective sees a gradual take-over of the code base by the SME / OS community and the stabilization of application cases. This would hopefully lead to a growth phase where even regional or national funds become obsolete. The DSpace example in appendix I show that this is not an unusual timetable for similar initiatives.

5 Conclusions

Sustainability is one of the most important issues regarding any project coming to its end and DBE relying strongly on open source projects is no exception. Sustainability in DBE context is particularly difficult question because of the numerous stakeholders and different perspectives included in the project.

In this deliverable the regional sustainability has been brought in the front as the first step towards DBE sustainability. Multi-stakeholder analysis presented in chapter 2.2.1 proves that it is very difficult to identify and analyse stakeholders and their approach to DBE. This approach needs to be utilised, however, in order to obtain sustainability within DBE as a whole. DBE sustainability consists of the sustainability of regions, science, technology and business and furthermore from the sustainability of each stakeholder participating in DBE. Initially the multi-stakeholder approach has been utilised in the regions which have a more limited set of stakeholders than the whole DBE. Also, the application of multi-stakeholder approach to all stakeholder groups in DBE was started in all stakeholder groups in chapter 3. The following figure describes the stakeholders that have participated in the creation of this deliverable.

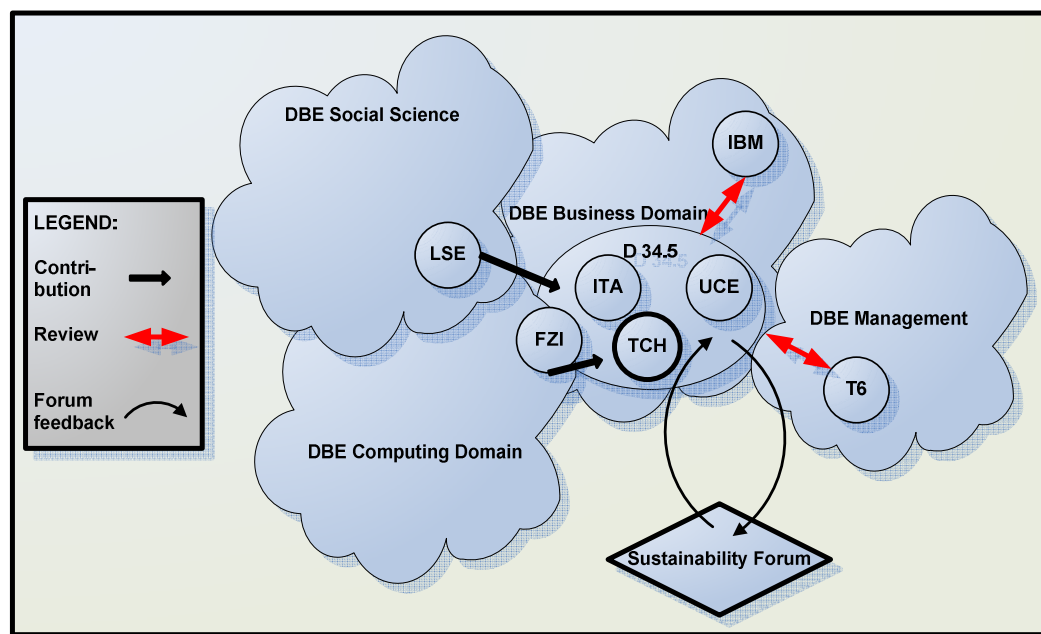


Figure 8. Roles in the creation of the sustainability plan

TCH has been in main responsibility for creating the deliverable. Other partners with dedicated resources to this have been FZI, ITA and UCE. LSE has coordinated the social sciences contributions and described the relationship between governance and sustainability. IBM and T6 have acted as internal reviewers of the report. The deliverable has also been made available in the Sustainability Forum in DBE website to allow feedback from all stakeholders interested in the sustainability of DBE.

The social sciences, developers' and business perspectives provided different angles to sustainability. Social sciences suggest that in addition to perceiving DBE as a good it could also be thought as a "version of society". Business perspective supports the

approach of DBE considered as a good as it derives directly from the needs of the SMEs and although they have seen value to the social networks that they have been able to connect, ultimately the success of DBE depends on the efficiency of the infrastructure compared to the time needed to learn and use it. Developer approach proves that the software development of DBE has its own course that aims in supporting both stable business use and innovative R&D use of the infrastructure, which supports different stakeholders very well.

The essence of this deliverable is to approach sustainability three-dimensionally;

- 1) DBE layers and key sustainability issues
- 2) Different stakeholder groups
- 3) Requirements, activities and resources.

This is the multi-stakeholder approach put into DBE layer context. In this deliverable the actual analysis of this model is rather shallow but it will be extended in the following final sustainability plan.

Each current DBE stakeholder needs to create their individual sustainability plans in order to continue work with DBE in the future. In this deliverable the regional sustainability plans lead by the regional catalysts are presented. As mentioned earlier, regional sustainability is one way of reaching sustainability in DBE.

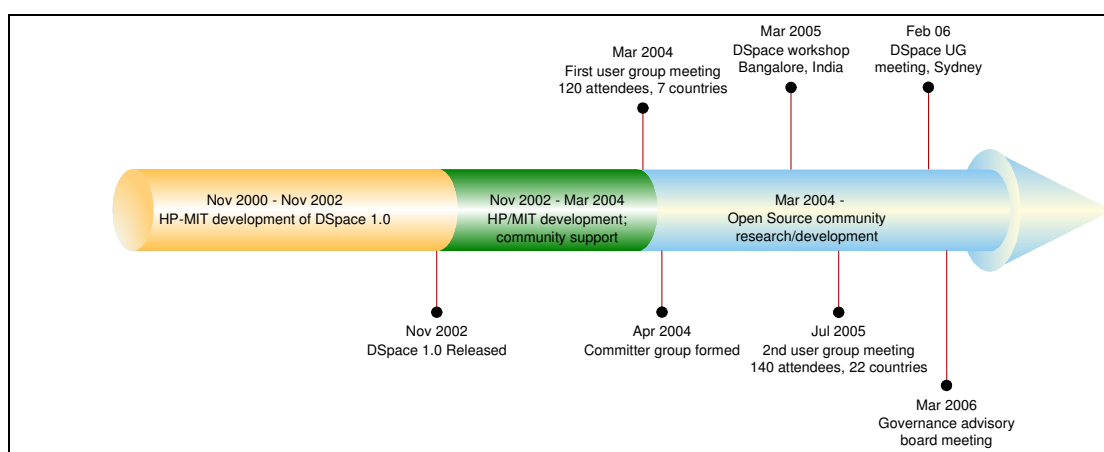
Appendix I

Sustainability Case example – DSpace¹⁶

DSpace is a technology platform initially created as a joint project by HP and MIT in the USA. The idea of DSpace is to capture digital research material in any formats directly from creators, describe it using metadata and persistent identifiers, distribute it via web in an open and visible archive and preserve it in a managed, long-term storage. The project was initiated in November 2000 and in 2006 it has 137 registered “live” production sites in 47 countries with about 400 000 content items. The project has 60 contributing developers and support from commercial service providers. Both HP and MIT are still active stakeholders in the project.

DSpace’s road to sustainability has had three stages:

- Stage one: Release of open source software
- Stage two: Transition to a community project
- Stage three: Development of a governance structure



The DSpace software development began in November 2000 as a joint project of HP and MIT. The plan was from the beginning to release the software under open source license after some maturity had been reached. The idea behind this for HP and MIT was to drive DSpace development through the open source software development model, share maintenance and support for the software in the long term and build critical mass of content. Also leveraging distributed expertise in for example metadata and digital preservation was seen as advantages in open sourcing the software. After two years of “closed” development the first open source release of DSpace 1.0 was done in November 2002.

¹⁶ From the presentation “In Pursuit of Developing a Sustainable DSpace Open Source Project” by Ms. Julie Walker from MIT in “Open Source and Sustainability” –Conference in Oxford UK April 11th 2006. Available at <http://www.oss-watch.ac.uk/events/2006-04-10-12/presentations/juliewalker.pdf>

The stage two was done in two phases. Between November 2002 and March 2004 HP and MIT continued developing the software and provided community support to other interested developers. Software adopters focused on implementation and collection of content, but they also began to complain and request new features to the software. In March 2004 began the second phase of stage two as the first user group meeting was held. The adopters started to produce their own DSpace services, began to contribute support to new users and contribute bug fixes and feature enhancements. DSpace committer group was formed and the first commercial service providers emerged.

Open source projects have two roads that they can follow in order to obtain sustainability;

- 1) Sponsored or spinout project (E.g. Eclipse (IBM), OpenOffice (SUN) and Mozilla (Netscape)

*A sponsor of an internally developed software project releases their code to the public under an open source software license and invites an external community to join the project.*¹⁷

- 2) Community project (E.g. Linux, Apache, Debian, GNOME)

*Publicly initiated by one or more individuals, independent of their employment context, to recruit developers to contribute to software that is still in its infancy.*¹⁸

DSpace started as a sponsored project but the aim from the beginning was to establish a community project. It can be argued whether HP and MIT have succeeded in this or not.

The stage three, development of a governance structure is just starting. The investments in DSpace have been growing and the community has expressed a need for more project structure and stability.

The DSpace approach emphasizes that open source project sustainability isn't a checklist; it's an ever-changing, ever-adapting plan. It requires value to the market/user base and an active developer community. Further requirements include opportunities for commercial involvement, collaboration infrastructure, coherent legal structure and sensible governance structure.

¹⁷ O'Mahony and West, 2004

¹⁸ O'Mahony and West, 2004