



Digital Business Ecosystem

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Workpackage 5

Business Research Coordination

Deliverable D5.1.3

Final Assessment of Business Domain and Integration into a unique Vision



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1. Introduction

This final deliverable in a series of three deliverables will summarize the Business Domain achievements in a condensed form – similar to the corresponding deliverable D4.2 of the Science Domain – as well as reflect on targets that could not be achieved and that need to be taken up by further research projects both in the last phase of FP6 as well as in FP7.

The previous D5 deliverables have been addressing:

- D5.1.1 – The history of the DBE concept and the elements of the Business Domain vision
- D5.1.2 – The linkage between vision elements and the DBE action planning

In order to provide a linkage with the previous deliverables, we will refer in section two to the vision elements described in D5.1.1 and how far they could be linked to practical observation / concrete achievements.

In section three we will refer to the phases of the Business Domain action planning described in D5.1.2 and how far they could be reached.

In section four we will refer to the work areas and individual WP contributions to these achievements as well as to the perspectives for future research work.

An in-depth account of the sustainability of the Business Domain activities – also regarding to further regional uptake and possible links to regional structural funded activities – is given in the final sustainability plan D34.5.3.

2. Business Domain achievements by objectives formulated in the DBE business vision

The previous deliverables D5.1.1 and D.5.2 in this series have described the main elements of the DBE business vision as well as how the activity plan for the different areas of the Business Domain corresponds to them.

With regard to the DBE business vision elements formulated in the previous deliverables, the summary of achievements is as follows:

DBE Vision elements as described in D5.1.1 and D5.1.2	<i>Summarized achievements in the DBE project and lessons learned</i>	Overall status
<p>Confirm the business value of a non-dominated open ecosystem characterized by</p> <ul style="list-style-type: none"> ○ shared advantages to its members ○ evolutionary growth from small solutions ○ co-evolution of technological, social and economic elements ○ balanced individual utility and community benefits ○ without need of central control 	<ul style="list-style-type: none"> ○ It could be demonstrated that shared infrastructure and open standards provide a basis for building a DBE. It could also be demonstrated how smaller DBE networks – based mainly on existing business networks – can be leveraged for further growth. ○ The infrastructure developed by the Computing Domain has also addressed the main technological areas of a DBE that need to be developed further. It was clearly demonstrated that business relevant application cases can be constructed from that generic ecosystem infrastructure. In that sense, directions for further technology evolutions have been set. ○ It could also be demonstrated that a DBE can emerge based on small sized application cases – usually built on existing business networks. However, only very initial steps could be taken in that direction. Specifically a linkage between the different regional application cases and community participants has not been reached within the project time. Growth projections could however be made by simulations. ○ The co-evolution of social elements is a slower process and could only be observed in an embryonic stage – as e.g. through new social network links in the regional networks. ○ With regard to concrete utility for SMEs and also economic impacts based e.g. on new business models – only early indicators can be constructed from SME surveys and interviews as well as based on growth projections of the cases. 	<p>First positive indicators for value of DBE approach demonstrated - still early stage.</p>

<p>Activation and SME focus</p> <ul style="list-style-type: none"> ○ early formation of a community for take-up of DBE infrastructure ○ specific roles emerging for SMEs ○ community members taking an active role in maintaining and further developing the DBE 	<ul style="list-style-type: none"> ○ Formation of a DBE SME community of around 240 user companies and a core group of 44 software developing companies has been achieved. ○ Initial role distribution into Drivers, Implementers, Discoverers and Users has been widely accepted and proven to persist within the community. In that sense, this rather simple classification provides a very useful distinction between levels of willingness and ability to contribute to a DBE community. ○ With regard to the active role of community members in maintaining and further developing a DBE: By the end of the project, the dependency on core project members e.g. for further technical development of DBE infrastructure technology is still high. Whereas SMEs and also individuals have expressed interest to develop the initial DBE(s) that the project has created further, this relates more to the application level than to deeper involvement in core DBE infrastructure development and maintenance tasks. 	<p>Early DBE community formation achieved</p> <p>Active take-over only to a limited extent</p>
<p>Regional strategy and digital divides</p> <ul style="list-style-type: none"> ○ build on European regional diversity ○ integrate the DBE as a component into regional activities such as on e-Adoption or Open Source 	<ul style="list-style-type: none"> ○ The project has engaged three pilot regions with different cultural and business backgrounds. Further dissemination into additional regions has also been achieved and further widened the cultural spectrum. ○ Especially for follow-on activities the integration with regional strategies and regional funded actions has been partially successful (Aragon). It can be followed that the integration with regional development programs is an important future perspective for the DBE. ○ The DBE has turned out to be not a stand-alone approach but is specifically suited for the integration with other regional development activities. Here it can add a community building elements to ICT adoption, broadband connection or similar programs that often address companies only individually and not as part of a business ecosystem. ○ With regard to digital divides, particularly the Aragon case of rural hotel integration has to be mentioned. 	<p>Positive regional engagement – important direction for further DBE development</p>

<p>The DBE infrastructure as an interaction-ware</p> <ul style="list-style-type: none"> • facilitate and speed-up the creation of networked business solutions • be open for multi forms of DBE applications to emerge • grow solutions complexity from messaging to more complex collaboration and transactions • use semantics for service discovery and composition • provide perspectives for more advanced technical possibilities as for rule-based executions, evolutionary algorithms and model-based code generation 	<ul style="list-style-type: none"> ○ The project has developed both an architecture and a first reference implementation for a DBE infrastructure. It could be demonstrated in real world business contexts that the DBE infrastructure can be used to create networked business solutions with a much greater flexibility than point-to-point connections. ○ Application areas have been widespread. Mostly, the DBE infrastructure has been successfully applied where existing business networks could be integrated. Here, the DBE has shown to be a particularly interesting approach for the integration of many legacy technology generations – and also lowering the technical hardware requirement hurdle. ○ The general technical “entrance hurdle” for general DBE connectivity – that is creation of adapters, service manifests etc - is however still significant. The project has mainly addressed that by working with users indirectly through software developing companies. ○ User-interaction, more simplified mechanisms to become part of a DBE and possibly integration with other social networking technologies are important directions for future research. This have only be covered to a non-sufficient extent in the project. ○ Specific problems and application hurdles were reported in the SME cases with regard to semantics. That concerns the general demand for extensive upfront modelling and the complexity of BML etc. Usability and other means of semantics creation are key concerns for future DBE research. Here, the business domain has made important contributions through the market watch activity – e.g. in a deep market comparison with social networking (Web 2.0) technologies and general technological trends in SOA / semantics integration. Advanced technological features of a DBE – such as evolutionary algorithms – were simulated based on real world data taken from the pilot communities but could not be demonstrated in real cases involving SMEs. However, potentials could be simulated in the STU EvE simulation. based on real world data gathered by the CENSIS social network analysis 	<p>Infrastructure applicability demonstrated in real world context</p> <p>Early business applications constructed</p> <p>General usability hurdles</p> <p>Semantics / creation / usability is a key concern</p> <p>Evolutionary features not yet applied but potentials simulated.</p>
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<p>The business solution layer</p> <ul style="list-style-type: none"> ○ start to build a solution layer composed of <ul style="list-style-type: none"> ○ DBE-compliant applications ○ DBE application services ○ DBE models ○ DBE gateways ○ help to emerge regional and / or sector-specific solution packages ○ provide replication of DBE solutions into the community 	<ul style="list-style-type: none"> ○ Given the entrance hurdle questions from the previous point, the conceptual answer of the project has been the development of a DBE business solution layer. ○ However, the business solution layer could only be generally demonstrated from individual software developing SMEs that have adapted their applications to the DBE. ○ The outcomes have not yet reached the maturity of full DBE-compliant applications. In the same way, DBE application services or business relevant models have only been created at a very initial level. ○ Given just the number relations of e.g. 44 software developing SMEs versus around 250 users that could be engaged in the project time – it is obvious that the growth of a DBE comes from the users side. ○ Whereas the feedback collection and analysis in the project has mainly concentrated on software developers – e.g. through interviews etc – future activities should also investigate the interaction and decision criteria of pure users - that often perceive the DBE as a mere background phenomenon and interaction mainly through an intermediate business solution layer. ○ The same applies for DBE gateways e.g. to social networking platforms or e-business environments such as marketplaces. 	<p>Business solution layer only in very early stage</p>
<p>The sustainability perspective</p> <p>manage the process of activation into a sustainable growth path with the main indicators being formulated</p> <ol style="list-style-type: none"> 1) Demonstrated usability in first DBE application cases. Transfer from demonstration into real business use. 2) Successful nurturing of active DBE community members – Drivers – that take over further DBE dissemination and development. 3) Set-up of a governance organization through a transparent and inclusive process of consultation and 	<ul style="list-style-type: none"> ○ With regard to the indicators that we had formulated in D5.1.1: <ol style="list-style-type: none"> 1. Real business use of the DBE in the sense of real business transactions taking place could not be achieved but realistic testing in situations that were directly derived from real business use was achieved. It was specifically requested from software developers to integrate existing applications and business scenarios as well as users in their DBE cases. This could be demonstrated. However, SMEs have also highlighted issues of stability, security, identity mgmt. etc. that would need to be solved in order to allow real business application of the DBE infrastructure. From the viewpoint of a research project, the DBE technology has certainly come remarkably close to business applicability. 2. Some SMEs have taken Driver roles with great enthusiasm but SMEs have also reported on their 	<p>Sustainability initiated – not self sustainable but dependence on continued EU or regional funding.</p> <p>Take-up by Open Source world is premature but has generally started.</p>

<p>that is gradually taken over by the community.</p> <p>4) Growth of the community beyond publicly funded actions</p>	<p>limited ability to take on wider responsibility – especially in the area of further development of DBE infrastructure technology. The process of nurturing active community members is in a very early stage and will evolve in connection with follow on projects and regional activities in the DBE area.</p> <p>3. A governance organization could not be established within the project time. Instead several positions have emerged within the project on the issue of how governance could be organized. In that context, the process of consultation and especially the final Delphi survey had a good participation and showed the importance but also complexity of the matter.</p> <p>4. The further growth of the community is at the heart of DBE sustainability concept. Independence of public funding has not yet been achieved so far – given especially the maturity of the DBE technology and the absence of a business solution layer. However, interest could be raised already e.g. with Open Source communities such as JBoss.</p>	
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3. Business Domain achievements according to the overall action strategy

The project has developed a model of DBE community growth phases as well as one of community actors (see figures 1) that have been successfully applied in the regional engagement and training strategy. The same applies to the concept of regional catalysts. Several elements of this approach have also been adopted in PEARDROP – the follow-on project on DBE regional engagement and policy proposition.

Whereas the previous section has discussed the achievements / status of the Business Domain activities against the business vision elements, we want to now revisit the status of the different phases. This provides an assessment of where the DBE initiative stands in terms of community development.

DBE Engagement Phases

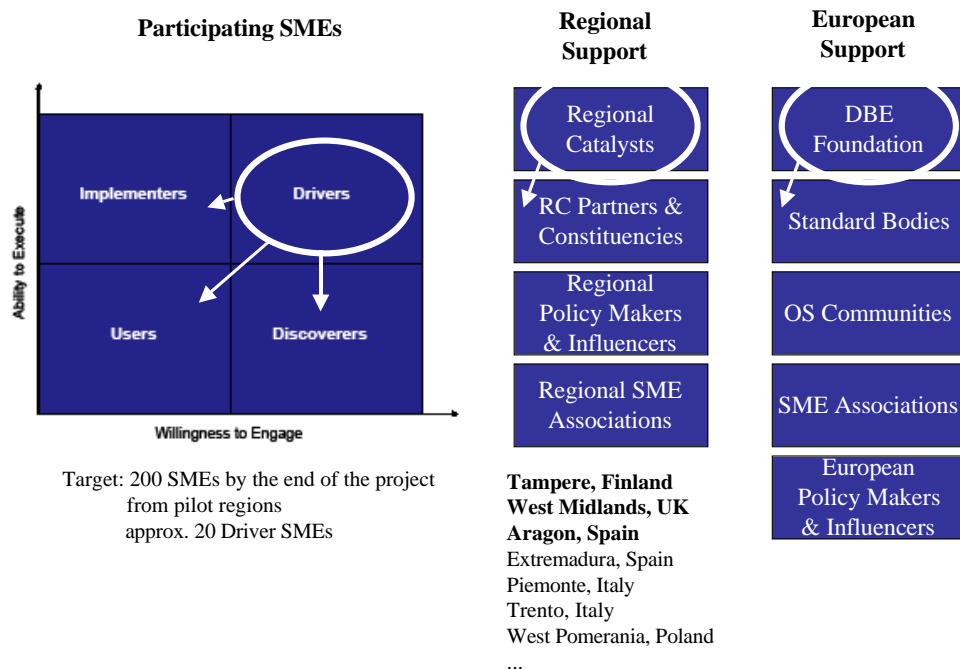
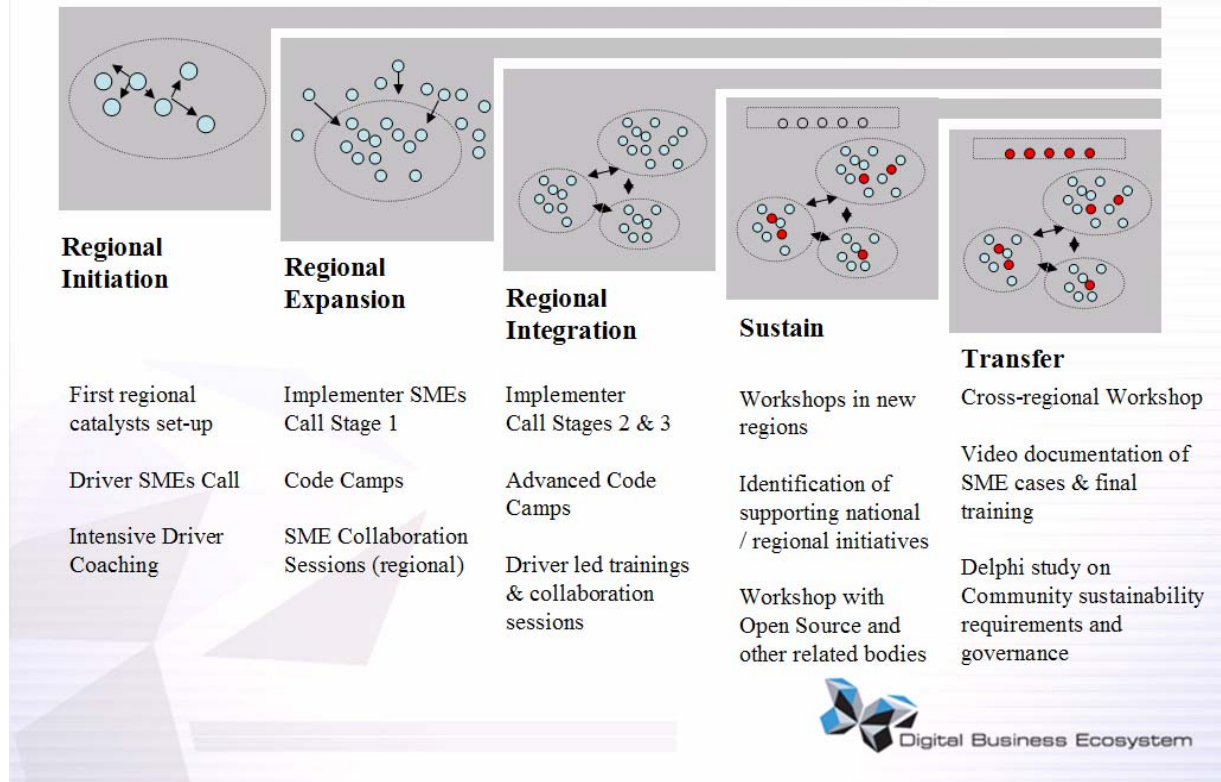


Figure 1 : Phases and actors model of DBE community development

DBE action phases	<i>Summarized achievements in the DBE project and lessons learned</i>	Overall status
Regional Initiation <ul style="list-style-type: none"> ○ setup of a first small DBE community in the pilot regions ○ project in a pushing role, actively selecting, encouraging and enabling Driver SMEs and other actors to join the DBE on a regional level 	<ul style="list-style-type: none"> ○ The activation of the three pilot regions has been successful. Here the concept of Regional Catalysts has been particularly successful – adopted from the previous eLive FP project. The Regional Catalyst concept has been significantly worked out and described in detail in the D31.x deliverables. From differences in the pilot regions it can also be concluded that the activation of already existing business networks as well as the integration with running regional development activities provides a good ground for DBE developments. ○ In addition to the Regional Catalyst concept, the concepts of Drivers – developed by the project – has been important. The Driver concept builds on the centrality of individual players in a business ecosystem. This has been confirmed by social network analysis. Also other community roles (as described in figure 1) could be confirmed by social network analysis. ○ First phase training has concentrated on Driver SMEs with a previous intensive phase of Driver selection. The regional initiation phase used primarily face-to-face meetings and many one-to-one coaching sessions. 	Achieved
Regional Expansion <ul style="list-style-type: none"> ○ extends the regional DBE community through a call in two stages from an initial number of 3 to 5 Driver SMEs per region to about 30 software developing SMEs (Drivers and Implementers) per region ○ build an early stage DBE business solution layer per region ○ Activate pilot user community through software developers 	<ul style="list-style-type: none"> ○ Regional expansion has seen the growth of the community by a three wave recruiting of Implementers. ○ Implementers were also requested to propose joint application cases with pilot users and to avoid construction of artificial application cases. Instead real business scenarios and established applications were transferred to the DBE. ○ Particularly successful has been the training format of code-camps for Implementers. Code camps were intensive 3 day workshops where members of the Computing Domain explained technical concepts, helped software developers to install and configure DBE infrastructure and jointly develop small application examples. ○ The regional expansion phase also went along with a rise of electronic training 	Achieved

	<p>material as well as electronic interaction with the growing developer community. The project developed regional training material in local (Spanish, Finish) language and multiple small demonstration applications.</p> <ul style="list-style-type: none"> ○ Electronic interaction has been particularly supported by the use of wikis and weblogs – some of them being initiated by members of the DBE community on their own behalf and without funding or specific support from the project. ○ As stated previously an early stage business solution layer could however been established only to a limited early stage with applications e.g. tourism as well as in collaborative work or project management. 	
<p>Regional Integration</p> <ul style="list-style-type: none"> ○ foster the interaction between the regional communities ○ build a trans-European DBE community. 	<ul style="list-style-type: none"> ○ Regional integration has been marked on the one hand by integrating pilot regions experiences with new associated regions through a series of roadshows (in Ireland, Italy, Germany, Spain). On the other hand two inter-regional workshops have been conducted to integrate and compare regional DBE experiences. ○ Several of the new associated regions have also started to enter into the DBE initiative – e.g. by becoming part of follo- on projects such as OPAALS, ONE or PEARDROP. ○ Inter-regional integration of the DBE SME community, applications and pilot business networks is however still in an embryonic stage. Here, integration has certainly not been achieved up to the level that would make the DBE a trans-European business environment. 	<p>Partially achieved – new associated regions integration</p> <p>Integration of DBE community and application cases only started.</p>
<p>Sustain</p> <ul style="list-style-type: none"> ○ care for the setup of the future DBE governance ○ achieve Open Source compatible governance 	<ul style="list-style-type: none"> ○ The set-up of a governance organization has not been achieved within the project time due to different perspectives and approaches. However as stated previously a general community process has been started. ○ Also basic sustainability has been achieved through good connections with follow on activities in the last call of FP6 as well as regionally funded activities. Here specifically the pilot regional as well as the associated regions' activities can be continued through activities such as PEARDROP. The OPAALS NoE also provides an intermediate organizational support for the scientific community around the DBE concept. 	<p>Governance set-up not achieved</p> <p>But basic sustainability of DBE initiative reached</p>

Transfer		
<ul style="list-style-type: none"> ○ increased impact of DBE community members ○ knowledge transfer and training infrastructure has to be taken over by key actors or sponsors of the DBE community 	<ul style="list-style-type: none"> ○ Training and communication material have been developed exhaustively in the project but are also bound to the individual development time-points. E.g. technical examples and material may be based on previous releases of the DBE infrastructure. In that sense, training and knowledge transfer are ongoing vital processes for the DBE community. A significant take-over by the SME community has so far not been achieved. ○ Several self-driven activities by members of the SME community as well as adoption discussions with the Open Source world (e.g. JBoss, RedHat, Free Software Foundation Europe) provide an interesting development. 	Not achieved – however first encouraging developments

	ITA	UK	TCH	TOTAL
One-to-one meetings	+100	+100	+100	+300
Meeting in small groups (a media of 3-4)	50	20	25	95
Code camps, training classes and regional workshops	18	6	5	29
Dissemination events to engage other agents (other EU projects, other European regions, other OS initiatives)	20	8	12	40
Total SMEs contacted	453	100	100	653
Drivers SMEs (first SW developers)	4	4	4	12
Discoverers SMEs (first Users)	11	5	2	18
Implementers (follower SW developers)	21	3	8	32
User SMEs (follower Users)	70	70	100	240
TOTAL SMEs INVOLVED (SW SMEs + User SMEs)	106	82	114	302

Figure 2: SME involvement in the DBE

4. Business Domain achievements according to work area contributions

Before concluding we want to finally give an overview of Business Domain achievements / status from the angle and contributions of the different work areas. These provide also an index for the priorities of future DBE business research and community development activities.

In summary, collaboration within the Business Domain has been very intensive and productive. In that sense, it would not be productive to aim for a separation by individual partners. However, it is valuable to take a look at the type of contributions and the progress in the different work areas.

Workpackage	WP Name	WP Owners							Subproject Number	Subproject	Subproject Owner	Business Action Areas				
5	Business Research Coordination	IBM							SP0	Project Management	T-6	DBE Business Case (short & longterm)				
13	DBE organisation forms and dynamics	FZI							SP10	Business Networks and Regulatory Framework	FZI	Supporting business and legal aspects				
32	Regulatory Framework	LSE	WIT	ISUFI				SP10	Business Networks and Regulatory Framework	FZI						
28	Training	IBM	Intel	ITA	T6	TCH	UCE		SP8	Training	IBM	Regional Transfer & Training				
30	Transfer and Adoption	UCE	IBM	ITA	T6	TCH			SP8	Training	IBM					
27	SME Engagement	CENSIS							ITA	UCE	TCH	LSE	SP9	Regional Catalysts and Population	TCH	Building Regional Pilots
31	Regional Catalysts Action	TCH		Censis	ITA	UCE	IESE		SP9	Regional Catalysts and Population	TCH					
34	Exploitation and Sustainability	TCH	IBM	FZI	T6	CENSIS	UCE	ITA	SP11	Sustainability and Regional Policy	T-6	Sustainability and Dissemination				
35	The European Research Area and DBE	T6	IBM	ITA	UCE	CENSIS	TCH		SP11	Sustainability and Regional Policy	T-6					
33	Dissemination and Community Building	T6	ISUFI	(Neil)					SP11	Sustainability and Regional Policy	T-6					

Figure 3: Overview of Business Domain work areas.

4.1 DBE Business Case

The DBE Business Case is made-up on the one hand by the general vision elements as discussed in detail in section two and on the other hand emerges from the concrete applications of SMEs and their experiences. These have been documented through individual company presentations accessible on the DBE website as well as in video interviews of selected SME representatives.

The following table gives just a subset on current application areas of the DBE based on results from our SME collaboration workshop in Helsinki. All cases are here from the Aragon region. Just the example subset shows 4 different perspective in applying the DBE that lead to individual business cases and utility for the SMEs:

- Service discovery
- Interoperability – including legacy applications integration from different development areas and base technologies
- Channel enhancement towards new customers and collaborators
- Horizontal service deployed in the DBE environment to be used as a basic service by other partners

In summary, the DBE business case emerges as a composition of such individual cases with the central business vision elements that were described D5.1.1.

It could be seen that on the one hand SMEs relied strongly on experiences from other SME applications cases. On the other hand the multi-faceted application and service possibilities within the DBE have made the concept and the overall business case more difficult to explain than e.g. that of an e-marketplace or a collaboration platform.

Here, the business case development cannot be seen as a theoretical task in isolation but is at the heart of the emergent approach that has been followed in the DBE Business Domain where actual application and business cases are closely linked with an element of discovery and creativity that springs from the SME community in exploring the DBE.

In that sense, future work on the DBE business cases refinement should be built on the multiple early case experiences and on their further development.

Company	DBE area of application	Feedback from the SME
Azierta	<ul style="list-style-type: none"> ○ product catalogue – e-commerce library ○ used BML for service description, replaced central catalogue 	<ul style="list-style-type: none"> ○ ontologies will create more powerful services ○ Security, integration pose problems
Focus: Service Discovery		
Gabilos	<ul style="list-style-type: none"> ○ rural tourism management, hotel booking mgt., planning tool ○ Front end Integration of wholesaler application – travel agency - rural hotel mgt. / different software languages and suppliers ○ integration of different legacy applications 	<ul style="list-style-type: none"> ○ DBE has been used as a „transparent middleware“ ○ remove the burden from rural hotels to stay in contact with travel agencies – new business channel
Focus: Interoperability		
IriTec	<ul style="list-style-type: none"> ○ tool designed for the management and quality assurance in buildings ○ create and incidence, review, validate, list incidences ○ use ontologies to identify real estate agencies 	<ul style="list-style-type: none"> ○ replace central server based applications ○ integrate legacy ○ open network to new partners, provide a channel for very small
Focus: Channel enhancement		

		partners
		<ul style="list-style-type: none"> ○ improve discovery of business service providers ○ collaboration – composite applications
TB Solutions	<ul style="list-style-type: none"> ○ signature application – creation of a horizontal DBE 	<ul style="list-style-type: none"> ○ project is a good idea – but complex playground
Focus:	<ul style="list-style-type: none"> ○ service on security, signature processing and validation, policy mgt. of signatures, registration of signatures 	<ul style="list-style-type: none"> ○ infrastructure hard to configure. Technical problems: e.g. availability of test platforms
Horizontal Service	<ul style="list-style-type: none"> ○ DBE signature services applied for the government of Aragon 	

4.2 Supporting Business and Legal aspects

The work on DBE organization forms and governance as well as on the legal requirements that springs from this has supported the Business Domain activities. In general it was concluded that these are composed of:

- specific elements (e.g. legal requirements) that are closely connected to the individual business carried out on the DBE
- generic elements (e.g. DBE rules of conduct) that govern overall behaviour in the DBE

Legal analysis has specifically taken a look at the generic elements and the possible classification of them up to developing contract examples.

Governance is a multi-faceted activity that depends on the different actor roles as well as on the different application areas of the DBE. The project has here in a collaborative process with the community widened the perspective. It has not yet arrived at a conclusion which can be derived in the form of a scientific conclusion but depends on preferences and choice of the community.

4.3 Regional Transfer and Training & Building regional pilots

As stated above regional pilot building, transfer and training has been an activity of central importance to the project. In that context the close linkage between training, regional catalyst set-up and community building through the phase and actor models

discussed in section three has been successful. The approach developed within the project provides interesting possibilities for transfer to other research initiatives as well as the grounding for further development of the regional community.

With regard to training, the diversity of training methods as well as the successful use of social networking (Web 2.0) technology should be mentioned in particular. In summary the DBE project has demonstrated how – out of a limited partner consortium – a wide community of around 300 SMEs can be activated for active participation without making them a simple field survey environment. The methodology basis developed for this approach is a significant asset. The follow-on project PEARDROP will condense this into a tool-box format that can in particular be used by regional development agencies and policy makers.

4.4 Sustainability & Dissemination

The DBE project has started with a very ambitious vision of sustainability that reaches far beyond the usual scope of a research project. This vision has been to not only demonstrate and research on *a* DBE but to also provide an early activation move towards *the* DBE as a business reality. Given from what has been said previously this has been achieved to some extent but certainly not as exhaustively as the initial ambitions had forecast. However at the end of the project stands a refined DBE conceptual approach, an architecture and an early Open Source reference implementation as well as a true – even though still small – community of multiple European regions and SMEs. This goes along with multiple dissemination activities and scientific analysis as well as a scientific roadmap for the future.

Sustainability is still based on continued research investments. But we can see a growing parallel activity stream of regional development actions (some of them directly linked to wider development programs and structural funds).

We can also see a still early stage but slightly growing interest from established Open Source communities.

5. Summary

There is no final theoretical proof of a business vision – the ultimate proof is the acceptance of the market. When dealing with the Open Source world it could also be said the acceptance of the community.

Furthermore it is not an abstract business vision that spreads out in a business community but it is trust in concrete practical utility. The DBE concept and business vision that this project has developed has demonstrated to be a good candidate in that respect – certainly still at an early stage of development.

The market watch activity of the project has provided a parallel assessment of the surrounding business world and it can be said that multiple technological developments

are overlapping, competing or addressing similar domains and vision elements of the DBE. In that sense, it seems important to protect the consistency of the DBE approach for further development and research – as this makes up ultimately the main innovation of the project. The Business Domain has contributed elements that play into this consistent picture and that now are taken up by follow-on projects. The main ones have been summarized in this document.

It is open to follow-on projects to take the outcomes from this project and the new path that it has created – given the fact that out of several thousand of google-hits for the term “Digital Business Ecosystem” nearly all relate to outcomes and follow-on activities of the project. The project has created here certainly a European leadership.