

# INTRODUCING AN OPERATIONAL AND TECHNOLOGICAL E-COMMERCE FRAMEWORK FOR EUROPEAN SMES

## *Designing regional and interregional e-commerce zones for SMEs in four Less Favoured European Regions (LFRs) based on Request Based Virtual Organisation (RBVO) concept*

Achilleas Balatos, Kostas Petropoulos  
01 Pliroforiki S.A., Acharnon Str.438 , 111 43, Athens,Greece

Ioannis Ignatiadis  
Centre for Research and Technology Hellas – Informatics and Telematics Institute,  
1st km Thermi-Panorama , 57001, Thermi-Thessaloniki, Greece

Vladislav Jivkov  
Applied Research and Communications Fund (ARC Fund) ,  
6 Gurko Street , 1000, Sofia, Bulgaria

Markus Lügen  
Otto von Guericke Universität Magdeburg ,Institut für Arbeitswissenschaft, Fabrikautomatisierung und Fabrikbetrieb  
(IAF), Universitätsplatz 2, 39106., Magdeburg, Germany

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Abstract: Small and Medium Enterprises (SMEs) represent the driving force for local development and growth in European Less Favoured Regions (LFRs); geographical isolated areas characterized by poor business performance and a less developed and privileged economy. The introduction of e-commerce is considered as an essential element for improvement of local SME's competitiveness and position in the Global Market, supporting simultaneously these regions to overcome their geographical limitations and follow up international business trends. In the context of the IST-2001-33251 LAURA project, the potential for regional and interregional e-commerce development has been analysed in four European LFRs (Epirus, Messinia, Saxony-Anhalt, and South Central Bulgaria). Based on these results and adopting the notion of a specific type of Virtual Organisation taxonomy (Request Based Virtual Organisation - RBVO), we present an operational and technological e-commerce framework adapted to the specific context of LFRs. The paper outlines the core identified factors that will influence the introduction and the effect of e-commerce in Less Favoured Regions.

## 1 INTRODUCTION

The advent of IT and Internet usage provide a new business paradigm for European companies and signified a far-reaching and fundamental change in global trading patterns. Nowadays, e-commerce has emerged as an integral part of business strategy

offering a range of services and opportunities for electronic trading in the global marketplace (Alcock, Cooper and Lawson, 2001). However, the degree of e-commerce adoption in Europe is differentiated from company to company accordingly to two main "digital divides" factors (E-Business W@tch, 2002):

- The regional digital divide arising from the different rates of progress in e-business development within the EU Member States,
- The digital divide by company size arising from the significant “gaps” between SMEs and larger enterprises.

The effect of both digital divides factors is cumulative for SMEs in European LFRs, expanding the e-commerce gaps and posing extra difficulties in adopting these technologies even in their primary forms.

European Union (EU) has already realised the importance of this issue on its effort “*to become the most competitive and dynamic knowledge-based economy in the world*” and has set the acceleration of e-commerce growth among SMEs as one of the major priorities of European e-business initiatives (E-business Policy Group, 2002).

The e-business evolution of LFRs in accordance with Community policies forms the main objective of our work. On this purpose, adaptive regional and interregional electronic commerce zones have been conceptually designed and will be physically developed in four European LFRs (Epirus, Messinia, Saxony-Anhalt, South Central Bulgaria).

Starting from the description of current business environment and information technology diffusion in LFRs, as this has been identified through surveys, this paper presents the proposed operational and technological e-commerce conceptual framework which will support the operation of regional and interregional e-commerce zones.

## 2 ANALYSIS OF LESS FAVOURED REGIONS (LFRS)

The analysis of LFRs environment from a business and a technological perspective was the first priority for our work. As soon as the interoperability of the developing framework depends on subtle issues such as the way business is carried out in each region, the technological capabilities of the companies and the SMEs actual requirements, we adopted a concrete strategy to elucidate the LFRs reality involving both qualitative and quantitative data collection techniques for the following industrial sectors:

- Agriculture and Food industry;
- Constructions and Building Materials industry;
- Tourism;
- Wood-processing and Furniture industry.

These are common or related business sectors in the four participating regions, in order to reassure the establishment of commercial transactions in an interregional level.

The strategy included both *direct surveys* (face-to-face-interviews, questionnaires) of key regional stakeholders and *exploitation of existing sources of information* such as national surveys and reports or available on-line databases. The direct survey was carried out with a sample of 244 businesses in the four regions.

In the end of the analysis phases, LAURA consortium had collected all the necessary information in order to understand the regional business environment and to evaluate the e-commerce opportunities and capabilities within the particular local and national business context (cultural, regulatory/legislation, market, etc).

### 2.1 LFRs’ Business Environment

The analysis of survey’s results from a business perspective revealed large sectorial and regional variations, verifying that the “digital divide” between the Western (Saxony Anhalt region) and the Southern European countries (Epirus, Messinia, South Central Bulgaria regions) it is not only a matter of regional technological capabilities but even more it is a matter of regional variations in entrepreneurial culture and attitude.

For this reason, in this paper LAURA participating Greek and Bulgaria regions, which are quite similar, are presented separately from German region of Saxony-Anhalt.

#### 2.1.1 Greek and Bulgarian LFRs

The majority of SMEs in these three LFRs (Epirus, Messinia, South Central Bulgaria) did not manage to follow up the rapid ICT and e-business development during the last decade, adhered to past business practises. Most of them are family owned companies which preferred to keep on doing their business in a traditional manner. Unfortunately, this static environment does not stimulate the adoption of new and alternative business models and technologies, protracting and amplifying regional SMEs problems such as:

- Regions geographical isolation.
- Low competitiveness capabilities resulting to a very weak market potential. For approximately 70% of surveyed SMEs, regional market is the major area that they are activated, while only 30% of the surveyed SMEs have an international presence.
- Fierce competition in local market, especially from low-wage economies. Around 60% of regional SMEs identified increased competition as a very important (possible the

major) threat for the accomplishment of their objectives.

- Lack of new investments.
- Complicated legal and administrative environment.
- Difficulties in finding appropriate partners for construction of cooperative business connections.

The key factors that function as main inhibitors for the development of regional business community are:

- Companies' tension to resist to any changes reflected as an "induction of new patterns of action, belief and attitudes" (Burnes, 2000). They are accustomed to have a functional, hierarchical responsibility structure with managers who are not very integrative and often "resist" the incorporation of new methods, since such methods signals to them the loss of authenticity and changes in the framework of intense cooperation (Gallo and Sveen, 1991).
- Firms negative attitude towards innovation as an additional burden and cost, rather than an opportunity and an investment for the future.
- Slow introduction of Information and Communication Technologies in SMEs business procedures. For example, SMEs communication with trading partners is conducted mainly through Fax (51%) or other paper based procedures (43%) while only 25% of the firms make use of email. The costs of innovative ICT systems, training and user-effort necessary to make the technology adoption successful are prohibitively high, while return-on-investment is long term, and often SMEs are looking for immediate or short-term benefits (Weiss, 2002).
- Lack of the necessary skills and knowledge (especially complicated sometimes) among SMEs personnel (managerial and technical). For example, only 18% of SMEs have declared that they are familiar with the e-commerce terms and issues. On the contrary, above half of the companies surveyed stated that they are less or not at all familiar with e-commerce concepts.
- Limited awareness and feeling of international commercial environment. Regional companies enclaved within the local business reality, could not anticipate their actual needs under a global context.

Nevertheless, the surveys results point out that the firms are starting to realise the necessity of Information and Communications Technology as the roadmap for the accomplishment of their main

business objectives (increase customer base, expansion into new markets) and over-passing external threats.

Therefore, the potential for introduction of e-commerce practices in these regions exist but they should be exploited through a carefully applied and transparent e-business strategy based on well defined business concepts.

### 2.1.2 German LFR

The Saxony Anhalt region is situated in the former eastern part of Germany. Therefore, most of the larger SMEs were developed from old East-German collective combines and if they are not owned by West-German companies, they are independent with a lot of difficulties in the market. The advantage here is, the companies are familiar with international businesses especially with niche markets (e.g. in Asia with Arabic Emirates or others).

The smaller SMEs in the sectors were traditional firms (transferred to the owner in 1990 after the change), family owned firms or new firms with greater problems with the sales of physical products than the large ones. In this case, the majority of problems are concentrated around the market field. Even if the companies from all relevant sectors have reasonable local or regional sales, there is still a lack of national or even international sales activities.

There are actually some e-commerce initiatives running or were finished in the past and therefore a big proportion (40%) of SMEs is rather familiar with the concepts and requirements of e-commerce. They connect this with experiences from e-marketplaces, on-line product catalogues as well as electronic order procedures.

However, most of these e-commerce projects do not have any actual benefits for the companies because either of their failure to respond to SMEs specific needs or of e-commerce systems' functional drawbacks. So a lot of companies were very reserved regarding the outcomes of e-commerce projects in general, given their experience of running similar initiatives.

## 2.2 Information Technology and Internet Adoption Level

In order to define the technological part of the LAURA framework, it was necessary to ascertain the technological readiness of regional companies for the introduction of an e-commerce solution through the LAURA survey.

The surveys' results were in fully compliance with the several national and European reports and studies on IT and e-business in European SMEs.

Most of the small firms are still in the very early stages of IT and Internet adoption and very few show any inclination to proceed and invest in more advanced forms of IT and electronic commerce.

More specific, our survey results reveal that the most commonly applied software solutions are office applications (83.83%), accounting applications (58.62%) and in-house databases (26%). On the other hand, the engagement of more advanced IT solutions such as Enterprise Resource Planning (ERP) solutions was very low (e.g. only 5.86% for ERP).

The majority (76.7%) of the companies surveyed reported that they do not have a network infrastructure, while a minority (21.72%) indicated that they have a LAN network in place. Regarding Internet access, most firms (68.2%) have some form of Internet access, whether PSTN, ISDN, Leased Lines or Wireless but very few make use of a broadband connection.

The participation in e-commerce projects generally proved an uncommon practice for the companies surveyed as long as only 8% of the SMEs are already participating in such a project.

Finally, regarding the number of IT-literate individuals that surveyed companies employ, this is relatively low (1 or 2 IT employers) in most cases (39.76%), whilst almost 50% of the surveyed companies do not employ any IT employee. Looking at whether companies have a formal education scheme for IT staff, this is in most cases negative (87.48%).

The above statistics have been estimated for Epirus, Messinia and South Central Bulgaria regions and do not include the German region of Saxony Anhalt.

### 3 SMES' PRIORITIES

In addition to regional business environment, the envisaged LAURA framework should address the actual SMEs operational and functional requirements, in order to support in the best possible way its interactions with the target audience (most importantly the SMEs).

For this reason, we adopted a solid requirements managements approach for eliciting, organising, communicating and managing these requirements. Based on the conducted survey, all the necessary information has been collected by the consortium and the frameworks' first high-level requirements has been extracted in accordance to SMEs priorities in organisational, operational and functional level.

### 3.1 Operational and Organisational Priorities

The term "operational and organizational" refers mainly to specific operations or services that expected to be provided within the LAURA established "electronic commerce zones" to SMEs of participating regions.

These organisational and operational requirements could be grouped under four main headings:

- *E-commerce Promotional Activities.* One key priority for European LFRs is to raise awareness of SMEs and stimulate their interest in e-commerce. Basic terms, opportunities, benefits, solutions, case studies, good practices and references will constitute the promotional content.
- *Training Services for SMEs.* SMEs training should concentrate on subjects such as e-commerce concepts and technologies, new emerging business models, business opportunities, etc. The training should be preferably organized and supported by a regional organization with direct access and interest for the local community.
- *Business Consulting Services.* The surveys' results identify the need for changes in SMEs' current business and trading practices in order to respond to emerged e-commerce models and increased market competition. The SMEs participating in an e-commerce effort, similar to that of LAURA project, should have the appropriate assistance and guidance for adoption of the appropriate trading practices and of a real entrepreneurial culture. A local organisation entity should be able to provide effective consulting services, when this is required, that will help SMEs to create and implement a realistic e-business strategy and overcome related problems. These services should be commercially independent, impartial and business focused.
- *Undertake an administrative role* Finally, the need for an organisational entity that should undertake an administrative role in the established e-commerce zones has been identified during the survey. This organisation should (i) operate as the intermediate in the process of introducing and supporting new business networks and synergies among the participating companies; (ii) undertake the assessment of e-commerce impact on the regions or the industrial sectors. It should identify barriers and enablers to the greater uptake of e-commerce

within the region or sector; (iii) secure alignment with e-Europe priorities at the regional level; (iv) provide collaboration with other complementary programmes or projects.

### 3.2 Functional Priorities

In the context of establishing the necessary IT infrastructure pursued by surveys results, the SMEs' high-level priorities and functional requirements for regional and interregional e-commerce have been identified and they are presented in Table 1.

Table 1: SMEs' Functional Priorities and Requirements

Requirement	Description
System Language	English being the base language of the system, with the possibility of local customisation for each country.
Service Level Agreements	The system should allow creation and negotiation of Service Level Agreements between trading parties, where all the details of their trading and collaboration arrangements are recorded.
Search Engine	The system should support advanced searching for products/services.
Joint Product Development	The system should allow companies to join their forces in order to jointly create a product or supply a service.
Marketing Campaign Management	The system should allow targeted marketing campaigns and joint marketing activities.
Purchase Orders	The system should allow the user to create, change, delete, etc, purchase orders. It should also allow a user to accept or reject such an order, query the status of an order, distribute this status to relevant parties, etc.
Invoices	The system should allow the user to create invoices, match them with orders received, check and amend the payment status for a product or service, process the payments received, etc.
Post-Sales	The system should allow the user to specify warranties, service packages, etc, for the products or services bought.
Logistics	The system should allow a user to examine the status of a shipment that is to be delivered.

## 4 E-COMMERCE ZONES FRAMEWORK OPERATION

Considering the results derived by regions detailed analysis and SMEs priorities, we proceed proposing the establishment of "Adaptive E-Commerce Zones" (EC zones) that will support electronic trading in inter-regional and intra-regional level. These e-commerce zones are being built upon the concept of a specific type of the Virtual Organisation taxonomy that is the "Request-Based Virtual Organizations" (RBVOs).

### 4.1 E-commerce Zones' Actors

These e-commerce zones include various types of actors that are classified upon the notion of "Electronic Commerce Kernels" and "Electronic Commerce Shells" (Figure 1).

#### 4.1.1 Electronic Commerce Shells

The Electronic Commerce Shells (EC Shells) are actually forming the regional repository of SMEs that the proposed e-commerce framework is meant for. This broad population of SMEs will cover all the local business sectors (e.g. agriculture, tourism) of primary, secondary and tertiary activities.

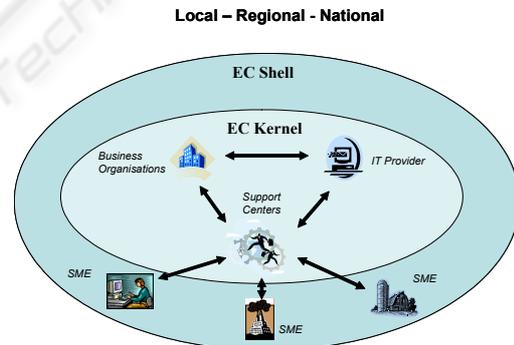


Figure 1: Regional e-Commerce Actors

#### 4.1.2 Electronic Commerce Kernels

Electronic Commerce Kernels (EC Kernels) have a rather supportive role providing e-commerce support services to SMEs for business cooperation, conduct of commercial operations and synergies development. The following different actors are identified within the context of EC Kernels:

- Support Centres (SCs)*. The LAURA operational framework proposes the establishment of regional Support Centres, organisations that will undertake the introduction of e-commerce capabilities to local SMEs and actually operate the regional and

interregional e-commerce zones. Specifically, they will provide the supportive services (consulting, promotional, training) and operate the actual e-commerce platform. The establishment and supervising of these support centres will be assigned to the local business organisations.

- b) *Business Organisations*. SMEs in European countries have access to a number of business organisations, such as Chamber of Commerce and professional institutions. As long as these organisations are skilled at representing the interests of SMEs, for example in political lobbying and trade negotiations, they have the potential, under the proposed organizational scheme, to truly act as intermediaries in the introduction of new technologies and innovative business management solutions (E-business Policy Group, 2002).
- c) *IT Providers*. The role of the IT provider is to provide the necessary technical support (technical advices, ICT infrastructure, training, etc.) for the establishment of e-commerce zones.

In conclusion, EC Kernels' actors will undertake to accomplish the largest proportion of SMEs' organisational and operational requirements.

Besides the EC Kernels and EC Shells actors, there are external actors such as Financial Organisations or Transport/Distribution Companies, which should also be considered.

## 4.2 Business and Operational Framework

Our framework is based on the four distinct phases of VOs life cycle (Strader, Lin and Shaw, 1998): *Identification, Formation, Operation* and *Termination*. Specifically, activities accomplished within each phase are:

1. *Identification*. Identification of possible RBVO entities will be aided including search capabilities in the system and enabling the exploitation of RBVO opportunities. Support Centres have the responsibility of identifying potential market opportunities and communicate them to e-Commerce Shells.
2. *Formation*. The actual formation of such RBVO entities will be triggered by the establishment of SLAs; integral contracting schemes that co-ordinate B2B relationships and collaboration within these entities. Support Centres will help RBVO participants to avoid conflicts during the SLA negotiation face, ensuring the smooth completion of the formation process.

Moreover, records of the resources and the core business of each participant should be stored in a system repository contributing to the right selection of partners.

3. *Operation*. The operational phase of RBVOs includes the accomplishment of financial / marketing / design / manufacturing arrangements, the distribution of products / services, etc. In this phase, Support Centres contribute by recording participants' performance and by helping SMEs to confront unanticipated obstacles. A special functional characteristic of the system to this respect is an alerting mechanism for the indication of misalignment with the strictly defined rules of a contract.
4. *Termination*. Finally, once a RBVO is terminated, the relative SLAs will be used for evaluation of companies' performance within this RBVO entity. Support Centres supervise the fair asset dispersal and the system repository is updated based on the results and performance of each participant within the RBVO operation context. So, this method of monitoring performance and measuring against SLAs, secures the managing and improving of service quality in inter-enterprise operations within a collaborative network of enterprises. A VO has several individual enterprises-suppliers communicating with one another, fulfilling customer requests and/or triggering e-services that carry out their parts of some complex workflow of transaction. Without the right tools, a VO has no way of knowing if it meets commitments to the customer, user and supplier.

Figure 2 provides an overview of the business and operational framework of the proposed EC zones.

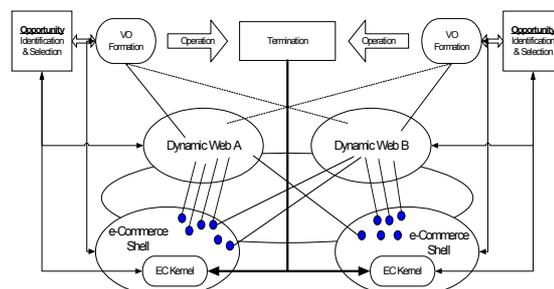


Figure 2: Business and Operational Framework

Our approach is generic in terms of adaptivity not only to regional characteristics but also to peculiarities of different business sectors.

### 4.3 E-commerce Zones Interleaving

One of the most apparent advantages of conducting e-commerce is the 'demolition' of the regional and national borders. This feature is extremely valuable for companies in LFRs, which do not have the opportunity to conduct business outside a strictly defined area around their physical location. The organisational pool is the sum of all organisations linked together with the LAURA proposed infrastructure. Our infrastructure enables the SMEs to conduct business and especially collaborative commerce with other SMEs even located in another country. Most importantly, this collaboration seems like a normal intra-regional collaboration. The LAURA framework provides the flexibility, interoperability, and openness needed for the successful evolution of e-commerce at a transregional level.

Furthermore the EC zones that are implemented within the LAURA project provide *Supported Activities and Functions* accomplishing the high level functional requirements delivered directly by SMEs.

## 5 CONCLUSIONS

Our surveys results have revealed a number of problems related with the business performance of SMEs in European Less Favoured Regions (LFRs). Such factors as geographical isolation, slow introduction of ICT and change hesitance obstruct the development of the regional business community within a global context.

However, the introduction of e-commerce technologies in accordance to a coherent operational framework, similar to that proposed in this paper, may provide the necessary impulse to regional SMEs in order to assert a dynamic presence in the European Market.

Based on the paper proposed framework, we are establishing EC Zones in four LFRs, involving a small number of regional firms that will experimentally perform business transactions over a prototype e-commerce infrastructure. The outcomes of this experimental phase will enable the evaluation and evolution of e-commerce zones.

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