INTEROPERABILITY CHALLENGES IN NEW MEMBER STATES SMALL AND MEDIUM ENTERPRISES REQUIRE SUITABLE EAI ARCHITECTURES

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Abstract: Taking Lithuania as an example, we mention and explain the main barriers for interoperability between different SME's. There are barriers valid for any SME and other barriers that are special for Lithuania and other New Member States. Inside this document we explain how we address these barriers with technologies like UBL and by different modules and their interplay; building a federated integration approach. As underlying technology to link these modules we are using an Enterprise Service Bus. Special to our solution is that human activities are supported by the modules during the B2B process in such a way that there is still enough freedom for them to interact directly with other trading partners, e.g. via phone, without messing up the process.

1 INTRODUCTION

In the last 2-3 years, the European Union has performed its biggest enlargement ever, in terms of scope and diversity. Since 1st May 2004, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia joined the *European Union* (EU), raising the total number of Member States to 25. In January 2007 Romania and Bulgaria joined too and further acceding countries will follow.

From an IT and economy perspective those countries are mainly based on *Small and Medium Enterprises* (SME's) without extensive IT infrastructure and experience. Strengthen their position and helping them to integrate into existing IT infrastructure would have a very high beneficial impact on European economy.

Our work concentrates on the integration between SME's taking the special situations and needs of less developed and new member states into account. As one example we choose Lithuania to describe existing barriers and problems (see section 2). Nevertheless, we believe that our ideas and solutions are also applicable to other states.

Section 3 of this paper describes our proposals to address and reduce the mentioned barriers. These proposals will be tested and according tools are developed within the EU project ABILITIES

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(*Application Bus for InteroperabiLITy In enlarged Europe SMEs*). In this paper we concentrate on specific modules and functionalities to underline our ideas. A more general presentation of ABILITIES architecture can be found in (Bagnato et al, 2006).

2 BUSINESS IN LITHUANIA

As an introduction to the interoperability challenges, the test case for Retail in Lithuania will be elaborated in more detail. But, let us start with its special situation: For Lithuania as for other east europe countries, you need to remember that the shift from Soviet System to an independent Lithuania is just 16 years ago. Changing a system does not change the people and their habits from one day to another. Nowadays small and medium business in Lithuania can be characterized as follows:

1. A significant number of business people are opening Lithuanian market towards both Eastern countries and enlarged European Union markets.
2. Enterprises in their everyday life accept only profitable activities, but
3. Enterprises are ready to invest into information technologies, if they can see obvious profits.

The first point is due to its location and to old still existing relationships. Lithuania and similar countries therefore can play the important role of a stepping stone or mediator to combine European Union markets with Eastern countries, like Russia. The second point is due to the evolutionary effect that took place the last years since having an independent market, where many businessmen failed or learned hard lessons. However, Lithuanian businessmen are aware that they have backlog demands regarding IT and they need to speed up to include it into there daily work, if they want to compete on bigger markets, as mentioned in point 3.

2.1 Potential

Lithuania shows a very high potential for IT investments. For example in 2006 within the manufacturing and supply sector 84,6% of the enterprises where connected to the internet. The network of internet centres is well spread over the whole country. The same is true for the private sector Lithuania (30%) overtakes EU countries such as Greece (18%), Czech (26%), Cyprus (26%), Italy (28%), Portugal (28%), Poland (29%) and stand near Ireland (31%) and Hungary (34%) in respect to internet connections. Lithuania even has the largest penetration of mobile connections (138,53%) of the world (by the data of international telecommunication market research agency "Informa Telecoms & Media" in December of 2005). This demonstrates that Lithuanian inhabitants are willing to adopt and deal with new technologies and it is only a question of time until the gap of not existing skilled personal will be closed.

2.2 Barriers

When we talk about barriers related to introduce IT to support interoperability between SME's, there are some very common, addressing nearly all SME's in the word and some are special to certain circumstances. Let us start with the common ones:

1. Understanding the current Business Processes – to introduce a new IT system the existing processes need to be understood and mapped. For SME's it is not obvious that the BP is already drawn somewhere using UML or similar technologies. For SME managers it is complicated to bridge the *language gap* (business terms and thinking versa IT terms and thinking) between them and IT specialists.
2. Change of current Business Processes – introducing or changing the IT system most times causes a change of the *normal* or *used* way to perform business and to some extend this is intended and should result into a benefit. However, many big project failed because users (employees) where not able to cope with these changes. Already the change of the graphical user interface bothers and annoys them.
3. Need for barging – SMEs' need to be competitive against big companies. Many times this is achieved by supporting special customer needs by customized products or special services. Therefore, prices, product and delivery details are more common to be under negotiation.
4. Maintain and understand the technology – be aware of all technology you rely on and that can not be changed easily is a difficult task not only for SME's. For SME's this is even more complicated as they have limited skilled personnel working for them.
5. Usefulness for the collaboration – when talking about an collaborative IT system that should connect SME's, it only makes sense if a critical number of partners are using the same system to receive according benefit out of the investment.

Of course there are additional common barriers. Unfortunately, we can only list the most important ones here. Other barriers are special or at least have a special importance in case of Lithuania:

6. Language – Lithuania is a small country and surrounded by a number of others with very different languages. It is very difficult to find appropriate ways to communicate, especially because English, as a common intermediate language, is not so common due to the old times.
7. Law – for the same reason (small country) the different laws of various countries influence the trade. Due to the young democracies these laws are still subject of major changes. On top the rules provided by government are sometimes hinder IT solutions with electronic document versions.

3 HOW TO REDUCE THE BARRIERS?

In our work we concentrate on the interoperability between two enterprises (B2B) and not within subsystems of one company. More precisely we want to reduce the effort needed to perform the core business transactions like order or invoice.

To do so, we think of a system that connects the different enterprises with each other and serves as a trustworthy mediator. From technology point of view our solution is based on an *Enterprise Service Bus* (ESB) where various modules are plugged-in to support the needed functionalities. A more detailed overview can be found at (Bagnato et al, 2006). This system is meant to be provided by a service provider, who maintains the system (barrier 4) and supports SME's in connecting their business to the platform. Additionally, it will be also the duty of the service provider during the build up phase to convince enough relevant SME's to join the platform and to address barrier 5.

As a common starting point to exchange documents we rely on the *Universal Business Language* (UBL). UBL is an international, royalty-free standard for business document patterns in XML, managed by the *Organization for the Advancement of Structured Information Standards* (OASIS). Version 2.0 was approved as official OASIS Standard in December 2006. To some extend one can compare UBL with HTML in the sense of being a common, low-level understandable language. The advantage of UBL compared to other approaches, e.g. EDIFACT, is the possibility to customize the messages according given requirements. On top the UBL Technical Committee (UBL TC) encourages people to work on localizations for different countries to provide translations and to list country specific requirements and constraints for validation.

By the flexibility of UBL documents we can already address barriers 6 (Language) and 7 (Law) we pointed out in the previous section as barriers. Of course this customization of UBL documents needs to be supported by appropriate tools. In fact those two points probably are only needed once for each country (and potentially slight changes are needed for specific domains). Therefore, this should be done by the service provider and it should not bother SME's too much.

In addition the flexibility of the documents can be used to customize the documents according special needs of each SME separately. This will make it easier to connect to existing legacy systems and the service provider can support these steps without demanding a full understanding of the underlying software. This also reduces the visible change for employees of the SME, who will remain working on their old system (addressing barrier 2).

However, slight changes of the business process will occur and where these changes are planned this hopefully results into an improvement. To do so, the current BP needs to be understood and build into the system. We generated a module, called *Process Designer*, to address this. Here the SME manager can draw their processes using a graphical representation similar to BPMN (simplified and more intuitive). Instead of drawing the complete cycle, he only needs to deal with small, hand able steps of the overall process and being supported by the service provider. This way we address barrier 1.

What remains is barrier 3 "Need for bargaining". To address this we developed three different modules focussing on different issues. Our central hypothesis here: There will be no system in near future for this task being flexible and intelligent enough to be as efficient as humans. On top the decisions will need to be done by humans anyway. However, support the human being with tools will increase his efficiency. Our tools therefore target:

1. Multimedia support linked or attached to the exchanged documents;
2. Supporting human to human interactions by the system;
3. Reducing barging process by a built in negotiation system.

The first two are similar in the sense that we try to include the human being into the system. Multimedia resources are mend to be processed by humans. There are cases a picture or voice stream can easily express the needs and in a way that can be easily understood by the receiving party. You can think of this as an offline communication that goes thru the system and will be documented.

The second module handles communications that are online and do not directly go through the system. However, the system will be aware that the communication took place and minutes can be placed, so, the results are visible (at least to humans). These two issues reflect our idea that on one hand side the system should be used as much as possible but on the other side to allow users to bypass the system in cases this is more efficient without breaking everything up (Pataki et al, 2007).

Last but not least we developed a negotiation system. Here the SME managers can define rules he wants to apply depending on certain circumstances. The most common example is a huge order beyond a given threshold. In this case a predefined allowance is granted. This rule can even be visible to customers. By being aware of the rule the customers might be motivated to order at least the amount needed to reach the threshold.

Instead of changing directly the values, e.g. total price, UBL has build in elements to handle allowances or extra charges. Using these elements provides better understanding for calculating end prices and provides the possibility to track back the applied rules.

Of course also the customer SME can have his rules and without any IT support which results into a loop of phone calls affecting even different persons. We do not say that the negotiation system will do everything automatically and will replace every phone call. However, reducing the number of loops within the barging process is already a benefit. Think of the system as being a mediator helping them to find together.

4 RELATED WORK AND CONCLUSIONS

With the approval of UBL 2.0 by OASIS and statements of UN/CEFACT to relay on UBL in case of providing a similar standard (McGrath, 2006), UBL was pushed and we expect a high acceptance of this standard. In Europe UBL is already used for e-invoicing for the Danish government since 2005. The EU project GENESIS (GENESIS, 2006) is more related to eGovernment. However, after the great success in Denmark the plans are to extend it and provide also for SME's an appropriate platform and services called *OIO Service Oriented Infrastructure* (Brun, Lanng, 2006). Due to the open architecture this approach is more flexible. However, we believe that with our single service provider platform based on an ESB solutions will be easier and quicker to be reached.

With the described modules in section 3, especially with respect to barging and negotiation, we try to support SME's without ruling them down. Our approach is not "all or nothing" instead the platform supports human-to-human communication when needed and this way following a more federated integration approach. Our modules and ideas where generated together with SME managers and therefore will hopefully meet their requirements. However, ABILITIES is still a running project and final results how SME's adopted the overall platform are still under evaluation. They are expected by end of 2007.

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