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Vision of Multilevel Modelling of Processes in Enterprise Architectures Affected by Big Data Collection and Analysis

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Introduction

Business process modeling has a long history of development. Encapsulated in a broader notion of BPM (business process management) it was researched together with the analysis, design, implementation, optimization and monitoring of business processes (Sanz, 2014). Hendrik Proper and Marc Lankhorst suggested vantage points for future research in the field of enterprise architecture [13].

Among them were: movement from information technology to intelligent technology that results in development of new social structures and future business models (1); movement "from Syntax to Semantics": semantic interoperability to cope with different semantic backgrounds in a multi-organizational setting (2); "From State-thinking to intervention-thinking": managing the evolution of the enterprise using architecture principles (3); "From operational capability to transformation capability" – the need for capabilities to transform the company itself to meets rapidly changing environment (4); "from intuition-based to evidence-based management": need for a leading mechanism of enterprise transformations (5).

In this work we semantic interoperability to cope with different semantic backgrounds in a multi-organizational setting contribute to (2) by analyzing how to cope with different semantic backgrounds in a multi-organizational setting when the integration scope of the company grows.

The "big data" phenomena resulting in the rapidly growing volume, variety and velocity of data accelerates this problem (Hurwitz et al., 2013). Proper and Langhorst (2014) suggest that the novel methods are needed to architecting the semantics of information and the behavior, "taking in account the variety and context of meaning and the social processes needed for create understanding and agreement at different scales". Frank (2014) claims that "to promote the beneficial development and use of enterprise models it is required to support the construction of respective modeling methods". The need for reuse of models is clearly mentioned.

The aim our work is to create conditions for multilevel modelling of processes that consists of the following stages: business-model —> executing model —> technological model BPEL.

Model of real-time business architecture (RBA)

The first RBA paradigm relates to development of new form of business process management, where the actors (employees, middle managers, even suppliers and customers) play a decisive role in business process optimization. The second paradigm is devoted to application of business services from public cloud. In this concept the Competitive advantage lies not in particular IS recourse or service, but in the best set of applied human & information business services for business goal.

The process of enterprise transformation starts from transformation to Subject-orientated Business Process environment. This transformation is organically realized in S-BPM tool Metasonic by "blue collar" workers in ad-hoc mode, moderated by senior executive. In this case, the real orchestration of real-time market requirements could be developed. Secondly, repetitive fragments of the processes are extracted and put into the private clouds for further usage in other processes. In case no appropriate service is found, enterprise searches through Cloud Computing Service Vendor (CCSV) public cloud service catalogue.

The state-of-the-art for today's technological facilities of the Big Data centers has started unique process of dictating new mental paradigm for traditional business mentalities. Now we should understand that not only referential models of business processes, or even executable blocks of business units can be simply bought from Clouds traders, but much more, something what always considered as a main asset of any business – expertise and intellectual capital. This futuristic reality of automated business engineering could be considered as an approach to the newer business vision, which is dictated by modern technological abilities and tendencies.

Cloud Application Layer provides the interface to the end-user (e.g. in form of a webpage). Often users pay certain fees in order to get access to such portals (Youseff et al. 2008, p.3). Cloud APIs should be encapsulated into Web services for service orchestration. APIs of CCSVs are stored in the APIs library in the platform and then are encapsulated into Web services for further usage.

From this respect, it's easy to see that in such business architecture only strategic targeting and monitoring is a responsibility of the true human executive level while the rest is compiled automatically from patterns and basics, best practices, and concepts 'as to be best'. In a final phase of business orchestration intellectual resources are selected from Clouds and after legal formalities are switched into action of the ready-to-go processes.

On the whole Real-time Business Architectures are more flat, interconnected (in a network) and could quicker be transformed according to business requirements [3]. Instant intellectual support expands, and subsequently – dissolves organization borders (see Figure 1).

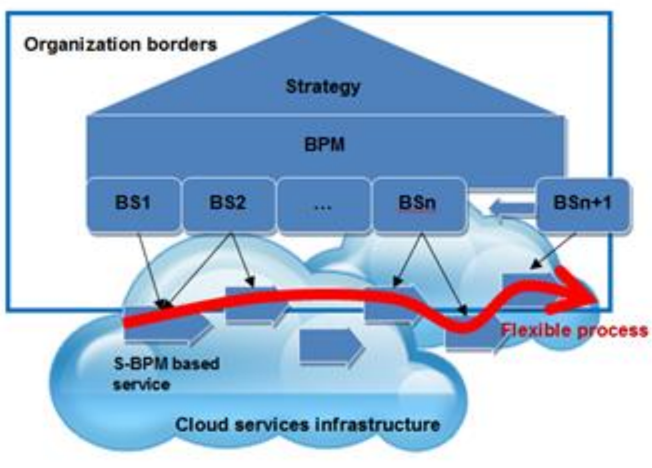

Fig.1. Real –time process handling in frames of SoEA[3]

A. Aligning cloud provided service and inner structure of the company by semantic approach

We propose to reduce the problem of aligning cloud provided service and inner structure of the company could by using semantic web approach (Martin et. al 2007). This approach allows automated determination of conformity on inputs and outputs among companies IS and BP and CCVS. It could be implemented with applying next steps:

- Firstly, company should construct ontological model of its structure and points of applying cloud solution. This model could be built with any suitable model from the semantic web technology stack; however, preferable model is decidable ontologies OWL-DL, based on description logic. There exists at a lot of public ontologies, which describes possible company's resources, processes and activities for almost every sphere, so the only task is to match companies architecture with these ontologies and instantiate them with exact companies data.
- Secondly, company should use formalized description of the CCSV provided as OWL-S document with its casual text description and build semantic mapping of that description with the company's ontology. Service's OWL-S description should contain definitions of its consumed data and provided outputs. Using these definitions, it is possible to determine inconformity of data structures and construct composition of services to solve required tasks.
- After defining the semantic mappings company should develop rules on SWRL – semantic web rule language [12] – language for dynamical checking of proceeded data. This step is necessary if the cloud service is used for proceeding the big amount of unstructured data and the gained results could be verified.

The application of Semantic web approaches to the task of cloud services integration is solving two important tasks:

- Task of creation the optimal solution is drastically simplified due to possibility of required service choice or even to build service composition for solving enterprise tasks.
- Due to linking between service and enterprise ontology and enterprise ontology with the architectural model, it's becoming possible to detect the contradictions between service in use and a new structure. Moreover, a new opportunity arises to apply the methods of automatic verification, that using meta-data could detect the redundancy the transmitted data or accomplished procedures.

Conclusion

The practical worth from cloud technologies triggers a number of businesses that are examining how, when and what to migrate to the cloud and seeking best practices in running hybrid environments that will save on IT budgets and resources.

This research paves the way towards ad-hoc business process altering in the concept of SoEA and results in updating the business model selecting business services from the virtual SOA and represents the basis for quickly adjustable "real-time" service-oriented enterprise architectures.

Research Limitations

As the cloud computing implies transferring data to the third-party vendors it is significant to measure the risks to be dealt with. The European Network and Information Security Agency (ENISA, 2009) stated about 50 vulnerabilities of Cloud Computing Environment and more than 30 risks (e.g. data protection, loss of governance and lock-ins, service outages, etc.).

Future research directions

As the discussion above has demonstrated, we have already learned a great deal about cloud service architectures. However, challenges remain: possible next research question could be about concrete processes that are most appropriate to be substituted with corresponding cloud services from the multi-vendor cloud service storage.

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