



Semantic technologies on the mission: Preventing corruption in public procurement



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ABSTRACT

Serbia recently decided to organize the country as a democracy, with major political goal to join European Union. This initiated adoption of new laws according to the best practice from European countries regulations. The area of public procurement was one of them, with major aim to increase the transparency and concurrency in the procurement process in order to make it more efficient. During last 10 years, we saw the rise and fall of procurement process in Serbia. Initially, new rules gave positive results, with constantly increasing amount of realized procurements and 7.2 as an average number of bidders per procurement in 2004. In order to support the process and make it more visible, Internet portal for procurement was deployed. Unfortunately, in the next period number of irregular procurements constantly increased while number of bidders decreased to an average of 2.7 in 2011. Analysts agree that major problems in the process are poor application of regulations and high level of corruption. Further, they identified three phases of procurement where corruption usually happen: planning phase, setting up estimation criteria and realization phase. Our proposal is to introduce semantic technologies in the process, in order to enable data manipulation by machines. We propose meta-model for the definition of procurement documents, and another one meta-model for the specification of alert rules, together with domain-specific language. This would enable an expert to set up rules regarding specific conditions, in order to be alerted about possibly irregular procurements. Application of proposed solution should enable earlier recognition of potentially irregular procurements, which can be prevented before realization or sanctioned prior to obsolescence.

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1. Introduction

Public procurement (PP) was always set as an attractive target for corruption. This can be contributed to the fact that in procurements people are using someone else money to provide common goods or services. That money usually belongs to taxpayers. Means of corruption are many, from creating fingered public calls to choosing a favourable offering party.

Luckily, in recent years the culture of eProcurement set in place. This enabled better dissemination of information and much more transparency in procurement process. Information became accessible to all interested parties and more importantly to the watching eye of the public. Another important benefit of using eProcurement can also be found in decrease in overall procurement cost. Nevertheless, corruption found a way of adapting to the new electronic paradigm of public procurement. Since the public calls are now available online and the process is monitored by public, corruption shifted towards the actions prior to publishing and also upon receipt of offers. The nature of procurements is such that calls are usually constructed in such a manner that description of needs is given in text. This enables creation of such calls that can be favourable for certain offering parties. Also, the criteria for choosing the best offer, although legally constricted, are mostly left to the committee that publishes a call. This can lead to choosing

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such criteria in advance that only certain offering parties can fulfil. For instance, one can require that offering company has done business in more than two continents. This criterion can set apart a certain company that diversifies its business globally but is not necessarily with most previous experience.

Serbia, as an European country, currently represents a growing market that is going through transition stage towards full capitalism. In previous years, the country started using eProcurement and initial results were promising. In retrospective that early period can probably be regarded as an adaptation period for the corruption factor. Today, a significant decrease in trust towards public procurement can be detected as well as in number of answers to public calls. Stable and independent public procurement system has a positive effect on market development. The number of bidders decreased from 7.2 per procurement in 2004 to 2.7 in 2011. Main reason is loss of motivation due to irregular procedures and high level of corruption. This specifically affects small to medium businesses (SMEs) that are considered a driving force of the economy. Strong motivation for improvement of public procurement system and minimizing corruption can be regarded in providing equal market opportunities that support development of competition and market-based economy.

Introduction of web portal in public procurement was initially done in February 2008 in Serbia. Legally, web portal was completely unrecognized and it functioned solely on procuring entities voluntary use. There was no legal obligation to publish procurement calls on web portal. With this in mind, it is no strange fact that during the first year of conduct public procurement portal recorded only about 100 public calls. New legislation set foot on January 2009 and it required procuring entities to publish every procurement call, above certain value, on newly established web portal. Still, the structure of documents was in free text form that did not enable significant data manipulation. Nevertheless, a significant rise in use was recorded, and up until April 2013, it recorded 66.119 public procurement calls. Latest version of the public procurement law, that set foot in April 2013, finally stated web portal as a main tool in procurement process. A significant effort was made to improve data structure and increase the semantics in the overall process. Furthermore, new international catalogues were introduced (common procurement vocabulary) in order to provide better understanding of Public procurements and to enhance transparency and concurrency.

The idea of this paper is to harness the power of semantic technologies in order to effectively fight the corruption in public procurement. Due to large amount of information published in procurement processes, people need the help of computing technology in order to process it. Public procurements propose a very fruitful ground for expression of human language. This is not very accommodating for automation purposes, especially if elements of corruption are searched in a large amount of cleverly conceived language constructions. In semantic web technology the idea is to give information well-defined meaning, better enabling computers and people to work in cooperation. In our approach, we will propose meta-models for the definition of procurement documents and rules, according to the latest data structure. Also, important improvement of current practice would be the development of domain-specific language for the specification of alert rules. This will enable automatic monitoring of public calls and raising alarms if something appears out of order.

In Section 2, we present state of the art in the field of public procurement. Section 3 provides short description of our modelling approach, Section 4 contains proposed meta-models of the procurement system. In Section 5, we demonstrate proposed approach by providing examples of specific rules, defined using proposed domain-specific language, based on meta-models defined. Finally, in Section 6, we state our conclusion.

2. State of the art

During the 1990s of previous century e-procurement was novelty in corporate environment. In these days automotive industry, retail industry and other industries enjoyed benefits of e-procurement [1–4]. Benefits were: low barriers for market entrance, price transparency, better opportunities to avoid “maverick buying” and to use preferred supplier networks, and better balance of power between sellers and buyers [5]. In public sector only few implementation were known [6,7]. The real expansion of e-procurement in public sector started at the beginning of this century. Today in many countries e-procurement has become part of everyday life. Various researches demonstrate both successful and unsuccessful development and implementation case studies of public e-procurement systems [8–15]. Early adopters of e-procurement system reported different challenges. Moon [16] recognized four – technical, financial, legal, and managerial challenges. The World Bank [17] recognized government leadership, policy and legal framework, institutional change, awareness and capacity building, and technology as critical success factors of government e-procurement. In their paper Vaidya et al. [18] have identified 11 e-procurement critical success factors in the public sector: end-user uptake and training, supplier adoption, compliance with best practices for business case/project management, systems integration, security and authentication, reengineering the process, top management support, performance measurement, change management, e-Procurement implementation strategy, and technological standards.

Many definitions of e-procurement exist. According to simple definition, e-procurement is the process of electronically purchasing the goods and services needed for an organization's operation [8,19]. Croom and Brandon-Jones [9] have presented comprehensive definition which states that e-procurement refers to the use of Internet-based (integrated) information and communication technologies (ICTs) to carry out individual or all stages of the procurement process including search, sourcing, negotiation, ordering, receipt, and post-purchase review. Definition of government e-procurement differs slightly from the standard definition of e-procurement. Government e-procurement is the use of Information and Communications Technology by governments in conducting their procurement relationships with suppliers for the acquisition of goods, works, and consultancy services required by the public sector [17]. E-procurement includes document management, bidding and contracting, electronic shopping, electronic paying and information sharing [8]. There are many forms of e-procurement aimed at specific parts of the procurement process such as e-informing, e-MRO, web-based ERP, e-sourcing, e-tendering, e-marketplace, e-auction/reverse auction, and e-catalogue/purchasing, as well as complete end-to-end solutions [18,20]. Public e-procurement can be seen as a complete end-to-end e-procurement solution [18].

Literature review revealed several trends of standardization in e-procurement. First trend is standardization of commodity classifications. Commodity classification importance can be drawn from the findings introduced in the UN Expert Group Meeting “E-Procurement: Towards Transparency and Efficiency in Public Service Delivery” report [21], that says “the more detail the commodity classification provides, the more the system is able to analyze spending and procurement patterns on the various commodities, ultimately leading to better analysis and decision making”. Reviewed literature suggests several standards. A general recommendation presented in “Electronic Government Procurement – Roadmap” is adoption of United Nations Standard Products and Services Code – UNSPSC [22] for several reasons: it is an open classification, has worldwide coverage, a hierarchical structure adequate for financial and administrative analysis, its low cost, and

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