

Digitalization of public procurement: barriers for innovation

Viktorija BABICA

**Institute of Business Engineering and Management, Riga Technical University
Riga, Latvia**

Deniss SCEULOVS

**Institute of Business Engineering and Management, Riga Technical University
Riga, Latvia**

Elvira RUSTENOVA

**Department of Accounting and Finance, West Kazakhstan Agrarian Technical University
Oral, Kazakhstan**

ABSTRACT

Digital transformation (DX) was introduced by the fourth Industrial Revolution. During the first decades of the new millennium DX provoked diffusion of digitalization of public procurement; that could contribute to achievement of enhanced efficiency, accountability, transparency, and participation of small and medium enterprises in tenders. Later the European Commission has emphasized the role of public procurement of innovation as a policy instrument to sustain smart and inclusive development, improve social welfare, provoke growth both of entrepreneurship and national competitive advantage. Despite the benefits provided by e-procurement, more than 60% of EU procurement procedures in 2017 used the lowest price as the only award criterion, excluding both innovation element and fair competition between suppliers. Thereby the existing system is lacking to compile with the tenets of public procurement policies. It was defined that effectiveness of e-procurement does not compile with efficiency of public procurement procedure; there exist barriers of purchasing innovation through e-procurement.

The study proved, public bodies lack of comprehensive approach of selection the awarding innovation proposal. This paper presents a research based model of a tender exhaustive award criteria to be adopted in the e-procurement system.

Keywords: Public procurement, Innovation, Digitalization, Award Criteria, E-procurement.

1. INTRODUCTION

Internet of Things, Artificial Intelligence, Big Data and Cloud computing became the major trailblazers of economic trends of the new millennium. By dint of global interconnectivity, real-time exchange of data and a fast growing IT environment it was possible to create a new paradigm of public procurement, which complements increase of the process transparency and forces organizations to enhance their potential of innovation to endorse competitiveness advantage [23].

Public procurement is being used by public bodies as a lever of economic, technological and social reform [20]. The interest in modernizing public procurement is linked to the justification of

that public expenditures on purchasing goods and services annually represent 14% [9] of EU gross domestic product (GDP), that is a purchasing power, which if performed intelligently could significantly contribute to the EU sustainability and welfare through acquiring innovation, supporting technical transfer and knowledge management.

In the frames of the present study e-procurement is understood as “the application of digital tools by public institutions while implementing procurement process of purchasing goods or services, in order to improve efficiency, sustainability, and accountability of the process” [21].

It is considered, that transformation of public procurement through digitalization could lead to the achievement of what public bodies among EU are aiming to: reduce costs, increase effectiveness of the process, better transparency of the process [12], improve small and medium-sized enterprises’ (SMEs) access to public procurement [17]. The present study seeks to prove if reforming public procurement could be a way to motivate, not inhibit, procurement of innovation and support for R&D.

This paper consists of five main sections. Section 1 provides a brief introduction of the main public procurement aspects related to the topic; section 2 reviews relevant literature on procurement and digitalization, definition of innovation, barriers of procurement of innovation, e-procurement correlation with purchasing of innovation, approaches of innovation evaluation; section 3 describes the used research methodology, presents data analysis and the study results. The final section consists of the conclusions and future research.

2. PROCUREMENT 4.0

Transformation of public procurement may adapt its perception of a purely administrative function to a more strategic one. Procurement 4.0 is a revolution driven by increasing digitalization, the use of cloud technologies and organizational process automation that transform traditional operations of public institution and the procurement function itself. It will establish an advantage by leveraging big data analytics for better decision-making, fostering innovation, and data integration to improve public procurement user experience and supplier performance. [12]

Public Procurement of Innovation (PPI)

Innovation Literature review of innovation concept served for development of the comprehensive definition of innovation as “a process, in which new or substantially improved product, idea, method or business process is launched, applied or acquired in a market or organization, creating new value for the consumer, a competitive advantage, and enhancing welfare of society”. [e.g. 18, 37]

PPI The concept of public procurement of innovation is defined as “a procurement activity carried out by a public authority that leads to purchasing a good or a service which does not exist yet, but can be developed via R&D process within a reasonable period of time [5] or is new to the market [14]. PPI includes acquiring of new products, launching or implementation of new production methods, usage of new raw material supply sources and organizational approaches. This way PPI triggers to achieve better value for money [20]. PPI has been highlighted as a mechanism which may contribute to satisfaction of major social needs which cannot be met by traditional methods [24], and SMEs are perceived as the drivers of innovation in this setting [10] as they may be less conservative and more agile.

Compared to regular public procurement, PPI intends to create an arena of interaction between the public sector and potential and actual private sector suppliers [26].

Digital procurement

Electronic procurement has been announced as a mandatory mechanism for all types of public procurement since 2018 and it was expected that the initiative will not only simplify the entire procurement cycle for all parties involved, but also improve the efficiency of the procedure [13]. These policies are a response to the fact that public procurement, and PPI in particular, remain hard to enter for SMEs [7], because those have to face several barriers in tender processes.

Pros and cons Wen & Wei as benefits of public e-procurement marked efficiency, lower cost, and time saved per transaction, as well as agility, and enhanced accessibility of procurement information, faster evaluation, and increased quality of procurement process. Neupane et al. concluded that e-tendering is perceived to have the potential to improve transparency and accountability, which in turn, can reduce the probability of corruption in public tendering. Several studies as well prove that usage of digital instruments by public bodies could be used as anti-corruption tools [39].

Brun et al. examined five directions of benefits of e-procurement; such as improved transparency, decentralization, accountability, controlled process, supply based systematization and maverick-buying reduction. [1]

As a benefit of e-procurement OECD emphasizes reduction of direct interaction between public procurer and supplier. Digital technologies provide a competitive edge by improving the speed and quality of procurement, reducing risk and enhancing innovation. [36]. According to Vaidya reduction of costs is the mostly proved indicator of improved efficiency of public procurement after implementing digitization [2]. Gardenal claims that digitization of bureaucratic ways of tendering into more effective forms of organization may lead to better efficiency of the process [5].

Although many benefits of e-procurement proved to be exaggerated [4, 30]. E-procurement generated positive impact, when applied intelligently, is incontrovertible, but at the same time the granted benefits provoke bigger opportunities for corruption. The exact study stands that gains from digitalization of procurement process are controversial. It is not clear how e-procurement is able to enhance, not inhibit innovation.

Improved speed and agility of public procurement may reveal an outcome in increased lobbying and fraud. The reduced time spent for a tender, diminished costs and automatization give more opportunities for public buyers to call back and open tenders with specifications developed for exact supplier. Digitalization of procurement process may lead to increasing outreach and competition, but on the other hand make it easier for bid-rotation.

As well according to Aghion increased competition among suppliers, may provide more or fewer incentives to innovate depending on the market structure of a certain industry [4].

Efficiency of procurement process

OECD assess public procurement by Key Performance Indicators (KPIs) such as efficiency of the process, openness and transparency of the procurement process, professionalism of the procurers, contract management and supplier activity [22]. In case of Latvia state the procurement process does not correspond with the required level of transparency, as the number of criminal proceedings related to public procurement and the number of received applications for procurement procedure violations, in 2017, 15% of procurement procedures were contested [17]. The challenging applications suspend the termination of the procurement contract, therefore the challenge can significantly impede the implementation of important projects or the provision of public administration functions.

According to the Single Market Scoreboard [31], the public procurement can be evaluated by amount of tenders with single bids, contracts closed without a request for proposals, number of tenders used the lowest price criterion and the average speed of public procurement. The European Commission in the last public procurement directive emphasizes the need to enable SMEs to participate in tenders; the present paper argues that this does not reflect the effectiveness of the procurement, because in some EU states SME form biggest part of economically active enterprises.

The present study argues that the efficiency of procurement process should be also evaluated by the amount of R&D contracts and procurement of innovation; the mentioned efficiency indicators of the procurement process do not reflect the nature of the problem as, for example, the tenders that were closed after receiving single proposal may be over specified with technical requirements that do not promote competition.

Innovation in public e-procurement: triggers and barriers

Georghiou et al. claims that the communication between procurers and suppliers is “at the core of innovation procurement policy” [25]. Edler affirms that a systemic user-producer interaction would emphasize procurement of innovation [8]. Edquist affirms that the scope of public procurement limits interaction between procurement contracting authorities and suppliers leading to information and miscommunication related problems [5].

The study concludes, that lack of direct interaction between public procurement parties within the e-procurement procedure may inherit purchasing of innovation. The lack of flexibility or accessibility of a certain framework of a tender may lead into dead ends of an announced call for proposal.

According to Valovrita [38] public procurement of innovation intends on compulsory interaction between the parties, because information about unmet needs must be considered with the potential supplier. E-procurement use for collaboration or supplier management, has not been mention among the approach benefits [6]. Walker and Brammer [15] argues that there is evidence that e-procurement may prevent SMEs participation in the procurement processes. Communication between the parties may help to prove SMEs' innovation potential.

Shortage of procurement process

The classic public procurement system was criticized for allowance to apply the lowest price criterion, since 2018 when EU commission made it obligatory to implement e-procurement, it became easier to qualify bids by price. Uyarra et al. reported that main barriers of procurement process are lack of interaction with procurer, the use of rigid as opposed to outcome-based specifications, shortage of skills and capacity of procurers and a poor management of risk. Additional key concerns expressed by suppliers embedded low feedback on unsolicited ideas and cumbersome pre-qualification procedures and conditions. The present study claims that potential supplier evaluation should not affect awarded bid [8].

It was concluded that e-procurement process despite all the provided benefits do not overcome barriers for procuring innovation.

Despite of the mentioned above benefits provided by digitalization of the process, one goal of procurement strategy is missing – support for innovation. Purchasing innovation has been affected by flaws in development tender specification, social habits and biases such as behavioral, technological and organizational and by incomplete award criteria.

Tender award criteria

The majority of procurement procedures are being awarded based on the only award criterion - the lowest price [31]. Although the overall efficiency of e-procurement in the year of 2017 average number of tenders evaluated by the lowest price criterion has increased comparing to 2015 and 2016. Inconsistency of the dynamics has been provoked by the new and only award criterion presented in 2014 by the EU Commission – the most economically advantageous tender (MEAT). [14] That is a inclusive parameter, which can be defined by each contractor individually. MEAT includes three indicators: the best price-quality ratio, as sub criteria for quality European Commission offers the following non-financial indicators: quality, technical advantages, aesthetic and functional characteristics, accessibility, social and environmental characteristics, marketing opportunities; cost-effectiveness approach; life-cycle costing [11].

It is not clarified what should be understood by quality of an innovation bid, thus it was necessary to conduct a literature review to define indicators which could be used as a comprehensive evaluation of the quality of an innovation proposal.

Literature review: innovation evaluation criteria

Quality Brian determines that *quality* of a product is its ability to meet the needs of the consumer [33]. According to Jasinki quality or value of a bid should be determined by their viability, benefits, costs and associated risks [3]. Innovation should be able to create long-term stability, ensure return on investment, provide unique advantage and bear an added value, that leads to a sustainable and balanced development [2]. The basic quality criterion of innovation bid should be understood by proposal's sustainability, performance, durability and performance advantage. As quality still stands for an embracing criteria, the research was followed by defining of auxiliary evaluation criteria.

Risk resistance Frequently it is not possible to predict the result of innovation, its performance and user response precisely, thus if the result is intangible, there prevail certain risks, such as technological, organizational, societal, market, financial and risk of turbulence [32].

Financial effectiveness Hittmar et al. mentions the payback period and the discounted cash flow as the basic financial criteria [34]. Cost-effectiveness can be evaluated according to economy, efficiency and effectiveness provided by a bid.

Competitive advantage Innovation is the driving force of entrepreneurship. Effective innovation brings depending on its level, competitiveness at both international and local levels. Innovations can offer the following advantages: new financial sources for entrepreneurs, removal of barriers in legislation and taxation, new cooperation, support for the availability of skilled workers and facilitating the acquisition and assimilation of knowledge [27, 29].

Level of novelty The challenge of assessing innovation is the novelty of it. Regardless of whether the novelty can be measured, the main challenge is to define according to what to measure it [37]. The novelty level refers to a technological change from a pre-existing product. The degree of novelty should be appreciated from different perspectives: organizational, societal and marketability.

Effectiveness of innovation is seen as the ability to improve the service or work process, deliver the greatest value to customer, to solve organizational problems, and to address shortcomings.

According to the literature review of award criteria of innovation assessment the present study concludes that most criteria imply quantitative indicators, but those determine subjective estimate. The study argues that the successful procurement of innovation could be maintained by digital procurement, but requires strict monitoring to prevent the effect of ineffective subjectivity on the results.

3. RESEARCH

Conforming to the last Public Procurement Directive each public body is entitled to define award criteria that are considered the best for the certain tender. If for a common case such as obtaining office products application of the MEAT criterion is relevant, then if a tender allows submitting variants or comprises elements of innovation no criteria where price or costs is prevailing should be implemented.

The present study was conducted in order to define relevance of the certain set of award criteria (fig.1) to be implemented in the evaluation of a tender in public procurement of innovation.

The research was based on the expert method. It was essential to obtain various viewpoints of different economic sectors representatives. The research lasted from February to December 2018 and included 49 experts from 21 sector, among those were academic personnel, scientific workers, representatives of government bodies, high level managers and directors of private companies. Experts were interviewed about their opinion concerning the relevance of the proposed set of award criteria for innovation in their field of employment.

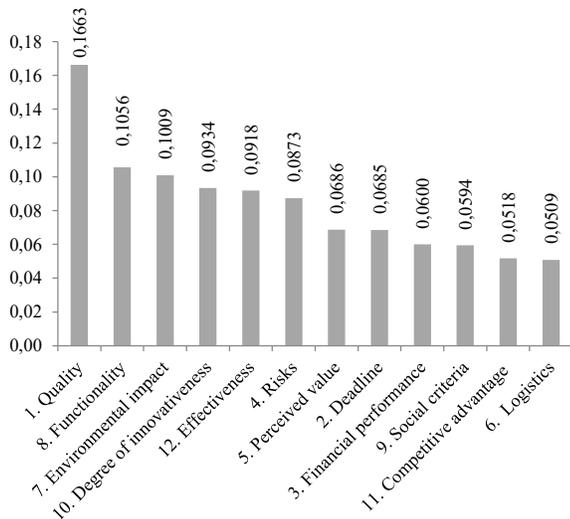
Evaluation of the award criteria was conducted by pair comparing of each of proposed criterion in case of predicting the potential for innovation success. The approach implemented permitted to define the importance of each criterion. No complete consensus was established due to industry differentials.

Findings

Information gathered through the interviews was analyzed by implementing the Analytic Hierarchy Process. Experts used 7-point scale for criterion comparison, where "1" stands for the equally important criteria, while "7" determines the very importance of one criterion. For each group of criteria, a normalized priority vector was determined according to Saaty methodology [36]. The Consistency Ratio was accepted up to 20% due to abstractness of the product evaluate by the proposed criteria.

Criterion of quality which stated for sustainability, performance, usability, potential decoupling effect and eco-effectiveness was defined as the most important with the priority vector of 16.6%, followed by criteria of functionality (10.6%) and environmental impact (10.1%) (fig. 1).

Figure 1. Innovation evaluation criteria weight.



Source: Author's original.

To reduce the amount of criteria thus to simplify the awarding process it was concluded to group them depending on reciprocal coherence. Out of 12 possible award criteria were formed 4 groups: quality criteria set; the added value determinant criteria;

social benefit criterion; risk, costs and other non-financial criteria.

Evaluation Model

The purpose of the innovation bidding evaluation process is to determine which bid best meets the requirements of the call for proposal or which offer may provide the customer the greatest value. The bidding process and the selection of candidates are two independent processes.

For digital procurement system to correspond to the public procurement principles such as transparency, equality and fairness, and as procuring the best value for money is the main aim of public procurement [27] is crucial to implement the following award criteria model in the comprehensive tender evaluation (table 1).

Each step of the tender proposal evaluation model contains certain criteria, which are explained by sub criteria and indicators, procurer may decide if to follow all the steps of the model. If each step is successfully and objectively evaluated, then the assess of a bid embraces the all aspects of potential innovation influence on different systems and environments.

Table 1. Tender proposal evaluation model

Step	Criteria, sub criteria and indicator	
Step 1	Accordance with the obligatory requirements	
	Sustainability	Ecology Society Economy
Step 2	Evaluation of quality	Performance (design) Technical Practical Esthetic
		Environmental impact Eco-design Resource consumption and emissions
		Functionality Productivity (effectiveness) Technical advantage
Step 3	Perceived value	Innovation measurement (assessment of changes according to:) The end-user Global Union Region Nation Organization Municipality Industry
		The competitive advantage of innovation Potential market share Financial strength Industry attractiveness Market stability
		Added value of the tender Conformity with long-term goals
Step 4	Risks, costs, logistics and other non - financial factors	Risks related with the proposal Threats Weaknesses Prevention Endurance
		Product life cycle cost Logistics
Step 5	Social impact	Social Return on Investment

Source: Author's original.

4. CONCLUSIONS

The aim of the study was to explicate the perceived benefits of public e-procurement such as increased transparency, savings for both participating parties, simplified and shortened process of procurement and better opportunities for SMEs to access to public procurement markets. Although it is not clear if simplified process do not provoke attempts of lobbying and bid-rigging.

Despite the useful and efficient opportunities that e-procurement can provide as a comprehensive digital platform, it has its downfalls. In light of EU Commission notice concerning support for innovation and R&D, it was examined what are barriers of innovation in within of e-procurement. It was concluded that public bodies lack of comprehensive tender award criteria model which could be used for procurement of innovation evaluation and be exhaustive, inclusive and fair. As well public procurement for innovation involves active communication between participating parties, which is eliminated by e-procurement system.

Bid price cannot reflect its innovation potential, also SMEs have less opportunities to compete with bigger rivals when only the lowest price criteria is implemented. Tender awarding process should involve full analysis of the merits of the bid. It is crucial to evaluate the proposal according to comprehensive criteria, which reflect the bid's quality, its potential impact to change, level of novelty and potential profitability. The approach will set it clear which of the eligible proposal may deliver the best value for money. The presented award criteria model should be embedded to the e-procurement platform for objective evaluation of bids.

Apart of the need to change proposal evaluation system, triggers for innovation should be implemented such as functional description of a tender and dialogue between suppliers and procurers.

As e-procurement system became obligatory less than a year ago, it should be analyzed if this change has affected statistics of purchasing of innovation and support for R&D. This matter is the basis for the author's further research.

5. REFERENCES

- [1] C.W. Churchman, **The Design of Inquiring Systems**, New York: Basic Books Inc. Pub., 1971.
- [2] J. Ivari, "A Paradigmatic Analysis of Contemporary Schools of IS Development", **European Journal of Information Systems**, Vol. 1, No. 4, 1991, pp. 249-272.
- [1] A. Brun, S. Ronchi, X. Fan, "What is the Value of an IT E-Procurement System?", **Journal of Purchasing and Supply Management**, 16, 2010, 131-140.
- [2] A. Cottam, J. Ensor, C. Band, "A benchmark study of strategic commitment to innovation", **European Journal of Innovation Management**, Vol. 4, 2001, pp. 88-94.
- [3] A. H. Jasinski, "Barriers for technology transfer: the case of a country in transition", **Journal of Technology Management in China**, Vol. 4, 2006, pp. 119-131.
- [4] A. Philippe, N. Bloom, R. Blundell, "Competition and Innovation: An Inverted-U Relationship", **The Quarterly Journal of Economics**, Vol. 120, No. 2, pp. 701-728.
- [5] C. Edquist, J. M. Zabala-Iturriagoitia, "Public Procurement for Innovation as mission-oriented innovation policy", **Research Policy**, 41(10), 2012, pp. 1757–1769.
- [6] C. McCue, A. V. Roman, "E-Procurement: Myth or Reality", **Journal of Public Procurement**, Vol. 12, 2012, pp. 221-248.
- [7] C. Nicholas, M. Fruhmann, "Small and medium-sized enterprises policies in public procurement: Time for a rethink?", **Journal of Public Procurement**, 14 (3), 2014, 328-360.
- [8] E. Uyarra, E. Edler, J. Garcia-Estevéz, "Barriers to innovation through public procurement: A supplier perspective" **Technovation**, 34(10), 2014, 631–645.
- [9] European Commission, "Communication from the Commission to the European Parliament, the council, the European economic and social committee and the committee of the regions: Making public procurement work in and for Europe", 2017.
- [10] European commission, "From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A European agenda for the collaborative economy", 2016.
- [11] European Parliament, Directive 2014/24/EU on Public Procurement, 2014.
- [12] F. Bienhaus, A. Haddud, "Procurement 4.0: factors influencing the digitization of procurement and supply chains", **Business Process Management Journal**, 24(4), 965–984.
- [13] G. Francesco, "A model to measure e-procurement impacts on organizational performance", **Journal of Public Procurement**, Vol. 13 Issue: 2, 2013, pp.215-242.
- [14] Guidance on Public Procurement of Innovation, European Commission (2014)
- [15] H. Walker, S. Brammer, "The relationship between sustainable procurement and e-procurement in the public sector", **International Journal of Production Economics**, 2012, 140.
- [16] Informative e-procurement (online) European Commission home page [accessed 8 May 2019], Available: https://ec.europa.eu/growth/single-market/public-procurement/e-procurement_en
- [17] Informative report of the Procurement Monitoring Bureau, 2017 [online]. LV PMB web page [accessed 8 May 2019]. Available: <https://www.iub.gov.lv/lv/node/40>
- [18] J. Schumpeter, "The theory of economic development: an inquiry into profits, capital, credit, interest and the business cycle", **Harvard Economic Studies**, Vol. 46, 1934
- [19] J. Stentoft Arlbjørn, P. Vagn Freytag, "Public procurement vs private purchasing", **International Journal of Public Sector Management**, 25(3), 2012, pp. 203–220.
- [20] K. Vaidya, K., J. Campbell, "Multidisciplinary approach to defining public e-procurement and evaluating its impact on procurement efficiency", **Information Systems Frontiers**, 18(2), 2014, 333–348
- [21] K. Vaidya, K., Sajeev, "e-Procurement initiatives in the public sector: Critical success factors that influence implementation success", **Journal of Public Procurement**, 5(4/5), 2006, 70-99.
- [22] Key performance indicators of public procurement (2017) [online]. OECD homepage [accessed 7 May 2019]. Available at: <http://www.oecd.org/fr/gov/ethique/procurement-key-performance-indicators.htm>

- [23] L. Downes, P. Nunes, **Big Bang Disruption: Strategy in the Age of Devastating Innovation**, UK: Harvard Business Review Press, 2014.
- [24] L. Georghiou, J. Edler, E. Uyarra, "Policy instruments for public procurement of innovation: Choice, design and assessment. **Technological Forecasting and Social Change**, 86.
- [25] M. Rolfstam, "Public procurement as an innovation policy tool: the role of institutions", **Science and Public Policy**, Vol. 36, 2009, pp. 349–360.
- [26] M. Rolfstam, W. Phillips, "Public procurement of innovations, diffusion and endogenous institutions", **International Journal of Public Sector Management**, 2011, 452-468.
- [27] P. Chatzoglou, D. Chatzoudes, "The role of innovation in building competitive advantages: an empirical investigation", **European Journal of Innovation Management**, Vol. 21, 2018, pp. 44-69.
- [28] P. Davis, D. Mckevitt, "Supplier development and public procurement: allies, coaches and bedfellows", **International Journal of Public Sector Management**, Vol. 27, 2014, pp. 550 - 56.
- [29] P. F. Drucker, "The discipline of innovation", **Harvard Business Review**, Vol. 63, 1985, pp. 67-72.
- [30] P.F. Johnson, R.D. Klassen, "E- procurement", **MIT Sloan Management Review**, 2005.
- [31] Public Procurement Scoreboard [online]. European Commission homepage [accessed 17 May 2019]. Available at: http://ec.europa.eu/internal_market/scoreboard/performance_per_policy_area/public_procurement/index_en.html
- [32] Risk management in the procurement of innovation [online]. European Commission homepage [accessed 17 May 2019]. Available at: ec.europa.eu/invest-in-research/pdf/download_en/risk_management.pdf
- [33] S. Brian, "Innovation overview and future challenges", **European Journal of Innovation Management**, Vol. 1, 1998, pp. 21 - 29
- [34] S. Hittmar, M. Varmus, V. Lendel, "Proposal of Evaluation System for Successful Application of Innovation Strategy through a Set of Indicators", **Procedia Economics and Finance**, Vol. 26, 2015, pp. 17–22.
- [35] S. Ronchi, A. Brun, "What is the value of an IT e-procurement system?" **Journal of Purchasing and Supply Management**, 16 (2), 2010, 131-140.
- [36] T.L. Saaty and L.G. Vargas, "Models, Methods, Concepts & Applications of the Analytic Hierarchy Process", **International Series in Operations Research & Management Science**, 2012, pp. 13 – 54.
- [37] U. Brentani, "Innovative versus incremental new business services: Different keys for achieving success", **Journal of Product Innovation Management**, 18, 2001, 169–187.
- [38] V. Valovrita, **Building Capacity For Public procurement of Innovation. Public procurement for innovation**. London, UK: Edwards Elgar Publishing, 2015, pp. 65 – 86.
- [39] W. Wen, L. Wei, "Decision-making Analysis of E-procurement with the Rough Set Theory", **International Conference on Wireless Communications, Networking and Mobile Computing, Shanghai**, 2007.