# Detailed Case Study

# Kyrgyz Republic: Developing and Piloting of New Audit Methodology for Electronic Public Tenders

## Big data and data analytics-based auditing of public procurements

### Data-driven and risk-based audit methodology for auditing digital procurement transactions using the Open Contracting Data Standard - Transformation and Analytics

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|  | **Lead Organisation**: The Kyrgyz Republic Chamber of Accounts; Public Procurement Department under the Ministry of Finance of Kyrgyz Republic; European Bank for Reconstruction and Development (EBRD) |  | **Location:** Kyrgyzstan |
|  | **Problem Statement:** Many countries have introduced eProcurement. Therefore, the state authorities, internal auditors, and Supreme Audit Institutions (SAIs), responsible for the monitoring and auditing of eProcurement transactions need to adapt their audit approaches and remain relevant to the interests of the general public in the field of public procurement. The state audit authorities and SAIs need to investigate how they can use eProcurement data analytics and supporting technologies in auditing eProcurement transactions efficiently and effectively. | | |
|  | **Description:** A model methodology has been developed based on the best practices from the experience of Latin America countries which are the most advanced in using eProcurement transaction data for auditing and monitoring as well as the Organisation for Economic Co-operation and Development (OECD). The model methodology is a useful tool to plan how to apply eProcurement data analytics and risk indicators during the audit process and therefore to improve the approach to procurement audit and the performance of auditors. The model methodology was adopted and piloted together with the Kyrgyz Republic Chamber of Accounts and a risk engine and data analytics modules were developed in the pilot project. The modules use eProcurement data that has been transformed to comply with the Open Contracting Data Standard (OCDS) and which provides a source data for risk calculation indicators and aggregate analytical insights in the tools User Interface (UI). The model data-driven and risk-based eProcurement audit methodology was developed and has been successfully piloted and therefore is ready to be implemented in other EBRD countries. | | |
|  | **Lessons learnt: 1. The underlying risk management concept** is a keydeterminant of success of the implementation of the model methodology – impacting the ability of the users to identify, assess and respond to the risks with the audit by designing and applying appropriate risk-based data analytics and tools; **2**. **Projects should be implemented in several phases**, giving an opportunity for the users of the model methodology to move up through the analytics maturity levels naturally and consistently while providing them with support to grow their capacity at each level; **3.** A **budget for training and outreach** should be included to ensure take-up, proper use and continuous development of the methodology and tools, **4**. The quality and reliability of data is critical for the tools that are developed to be able to support auditors in their work. | | |
|  | **Cost: €250 000 – 300 000** (the main factor impacting the cost of equivalent projects is the quality of the underlying data) |  | **Impact**: Enables public procurement policymakers to make **data-driven decisions**; Provides for the automated generation of public procurement reports; Ensures transparency of public spending. |
|  | **Human resources:** Project implemented by **EBRD and 3 IT/consulting contractors**, providing expertise in risk management and auditing methodologies data analysis software and web applications. |  | **Risks:** Gaining adequate **access to public procurement data and systems** required for the project, together with the expertise to understand these systems. Potential for political blocks to the project. |
|  | **Other requirements:** The project requires the extraction and then transformation of data **from the existing digital procurement platforms.** Other open government data sources can support more precise analysis. A similar project can be implemented in other jurisdictions building on a wide range (in terms of quality and types of data) of digital procurement platforms and open government data sources.  In addition, to ensure that the **set of risk indicator is targeting the significant risks in public procurement**, clear risk management frameworks, strategies and implementation plans according to relevant international standards should be in place. | | |
|  | **Project timeline**: Feb 2018 – June 2019 |  | **Project status:** Fully deployed |
|  | **Email:** NiewiadE@ebrd.com |  | **Website:** [n/a](https://www.ebrd.com/cs/Satellite?c=Content&cid=1395267322513&pagename=EBRD%2FContent%2FContentLayout&rendermode=live%3Fsrch-pg) |

#### Context and problem statement

Several countries including the Kyrgyz Republic in the EBRD region have introduced eProcurement as part of their public procurement and anti-corruption reform agendas. The introduction of eProcurement requires revision to the approach to monitoring and audit of procurement procedures, to fit new regulatory structures and legal and institutional frameworks incorporated in the eProcurement system.

Auditing procurement procedures conducted electronically requires a distinctly different approach from auditing manual, paper-based public procurement process. First, a data-driven audit methodology based on indicators must be established. Second, a standard for automatic electronic data collection from eProcurement systems used for transactions needs to be developed. Third, when appropriate transaction data is extracted from the eProcurement system/s, auditors require access to IT tools that support data processing and compliance and performance analysis. Last but not least, auditors need to be trained to work with the data-driven audit process, to execute their tasks accurately when using the new methodology, tools and procedures.

Therefore, introducing audit procedures for eProcurement tenders requires a careful analysis of the special characteristics of eProcurement procedures that may have an impact on audit procedures, followed by the development of special standards and a designated methodology that takes into consideration the particular features of electronic public procurement tenders.

Several mainly Latin American countries have successfully developed and implemented eProcurement audit. However as EBRD countries have no direct access to their international best practice and experience, a Technical Cooperation (TC) project was developed by the EBRD to design a new audit methodology for digitally conducted public procurements that is suitable for EBRD countries, to develop online tools for auditors to implement this methodology and to pilot the methodology and IT tools in selected EBRD countries of operations, the first one being the Kyrgyz Republic.

#### Objectives and vision

The EBRD TC aimed, together with the Kyrgyz Republic Chamber of Accounts (KR CA), to:

* design a new model audit methodology for digital public procurement based on OECD guidance and international best practice, and
* enable data-driven audit of public procurement in the Kyrgyz Republic through a pilot of the new audit methodology with the KR CA.

The EBRD-developed vision to achieve these objectives included the following:

* To identify modern audit best practice for electronically conducted procurement.
* Develop standards for auditing public procurement conducted electronically and a model methodology for auditing electronic procurement procedures.
* Develop a localised version of the model methodology for the KR CA public procurement audit.
* Deployment of an **OCDS-based set of analytical online tools for auditors** to enable an analysis of public procurement data for audit purposes and to pilot the methodology.

**Model methodology development and adopting for the KR CA public procurements audit purposes**

**Model methodology**

The concept of a model methodology for auditing digital public procurement with its recommendations and procedures has been produced for the use of audit professionals involved in auditing public procurement procedures conducted electronically, and to assist them in providing audit services of eProcurement transactions as a part of their public sectors audits.

The model methodology provides auditors with information on the conceptual foundation of data-driven digital public procurements audits. Also, it advises how audits should be selected, planned, conducted, and reported with the help of data-driven risk-based indicators and analytics applied to public eProcurement transactions.

**Adopted methodology for the Kyrgyz Republic Chamber of Accounts public procurements audit purposes**

The EBRD, together with the KR CA representatives, adopted the concept of a model methodology for auditing digital public procurements and adapted it for the jurisdiction of the Kyrgyz Republic. The KR CA, together with the EBRD’s consultants, piloted the adopted methodology for five audits of contracting authorities in the Kyrgyz Republic and the analytical tools to support the application of the methodology and trained 50 auditors for the pilot. The adopted methodology consists of:

Methodology for Risk Indicators and Red Flags

Auditors analyse eProcurement data to decide where risks, impacting the procurements objectives, are located using automated risk indicators and “red-flags” which are a useful, quick, and reliable type of analytics. The project developed a set of 32 risk indicators, and “Red-Flags” for the KR CA needs which are calculated using algorithms which identify transaction data patterns and provide an analysis of what is deemed to be risky. Each indicator has a profile with information about eProcurement transaction data used for calculation, potential risk it may detect, risk level, procurement type and stage an indicator is applied to.

Methodology for procurement transaction prioritising by risk

Auditors can select a date range and quickly retrieve the list of filtered transactions with risks arranged by risk level from highest to lowest and the prioritisation can be adjusted using parameters to reflect auditors’ judgment and needs. These parameters are flexible and can be changed to the new circumstances of the audit approach. Thus, auditors can get a complete picture of risk distribution among procurement transactions. This is helpful when building testing sampling strategy, as auditors can quickly pick-up the riskiest transactions for audit.

Methodology for contracting authorities prioritisation by risk

The methodology allows auditors to assess the level of risk for each contracting authority using the eProcurement system for a selected period. The contracting authorities are compared by aggregated information about procurement transactions, with and without risk, and those with riskier procurement profiles are prioritised to the top. This process also allows flexible and adjustable prioritisation parameters. The auditors may consider the prioritisation outcomes when performing overall procurement system risk assessment and deciding on the annual audit plan.

Automated scoring methodology embedded into the audit checklists.

The scoring methodology helps auditors automatically evaluate the testing results of a contracting authority or transaction selected for audit. The auditor rates each question in a checklist by its impact from 1 to 5. Where “5” is a very important question and “1” is less critical. The checklist calculates an aggregated score of audit answers, taking into account the number of adverse responses and their significance and the final calculated score provides auditors with a quick initial assessment of the results of the risk assessment.

Application of the methodology during each stage of the audit

The adopted methodology explains how developed indicators, prioritisation and scoring tools can be applied during each stage of the audit: risk assessment, planning the audit and testing strategy, audit execution and reporting/monitoring results.

#### Technological solution and implementation

Another EBRD public procurement technical cooperation project implemented a solution which **extracts data from the existing eProcurement system in the Kyrgyz Republic and converts it to the OCDS standard** while allowing the legacy solution to continue running unaffected. Once the data has been converted to the OCDS it is consolidated in one database.

**The analytical tool for auditors** has been designed to **access this OCDS database directly through an Application Programming Interface (API)**. The modules allow users to analyse the eProcurement data for audit purposes in accordance with the methodology and the auditors can analyse the data, using the dedicated UI, by many different combinations of risk. The comparative analysis of public tenders and contracting authorities is available by risk and by their performance. The semi-automated audit checklist, which analyses eProcurement transactions and risk information to support audit execution, has been developed. The overall result is that auditors have direct access to eProcurement transaction information assessed by automated indicators for potential irregularities and risks and can use it throughout the whole audit cycle.

**Development of the Data-Driven Risk-Based analytical application**

The analytical tool for auditors has been developed using the following fundamental principles:

**Modularity:** decomposition into functional modules with the possibility of subsequent parallel development, implementation and maintenance of individual components;

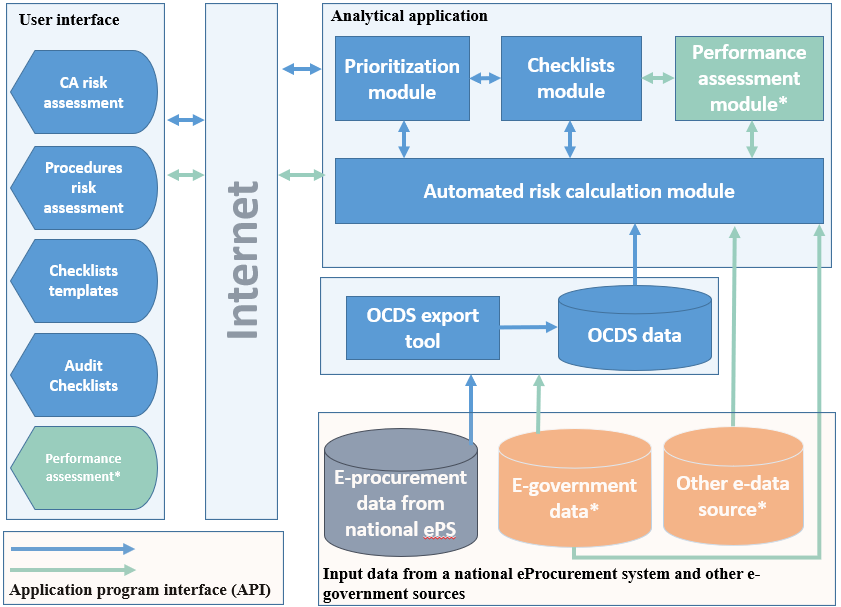
**Openness:** the use of open data, standards (OCDS) and open source principles;

**Secure access:** the solution ensures the separation of user rights to access functions and data;

**Interoperability:** the interface is completely understood, to work with other tools or systems in present or in the future and exchange information with one another based on application program interfaces (APIs).

Developed analytical tool for auditors has the following architecture:

Figure 1: Data analytics application architecture



*\*Suggested infrastructure components which were not covered by the project, however, recommended as next steps in the tool’s development*

eProcurement system (ePS)

The public procurement reform in the Kyrgyz Republic has been ongoing for several years, legislative changes were made and an electronic public procurement portal was created - [www.zakupki.gov.kg](http://www.zakupki.gov.kg) . The Kyrgyz Republic is on the track of becoming yet another country to adopt e-procurement fully. The ePS is still developing and needs to overcome a lot of challenges. However,  the Government of the Kyrgyz Republic is actively introducing IT technologies into all business processes in the state administration, and electronic public procurement is one of the essential directions in the field of digital transformation.

OCDS export tool and OCDS database

A module that integrates with the Kyrgyz Republic eProcurement system Central Database through a dedicated API and enables the downloading of public procurement data required for automated risk indicator calculation. It also performs the data conversion to the OCDS structure and stores standardised, cleaned and structured OCDS data in a centralised database.

Analytical Application

1. The automated risk calculation module

The module performs automatic identification of risks using algorithms for analysing historical data of eProcurement transactions. It models a set of data scenarios and relationships between them, named as a normal and risky scenario. This module can quickly process a significant volume of event data and provide low-latency queries on top of the data. It analyses [real-time](https://en.wikipedia.org/wiki/Real-time_data) procurement data by querying this data from the sources in line with coded algorithms and methodology. Queries results are stored inside the module together with each procedure and indicator calculations history. The module calculates each transaction risk level rank and expected value rank. The prioritisation module subsequently uses this information.

1. Prioritisation module

This module retrieves the results of eProcurement transactions’ risk indicator calculations from the risks calculation engine and other required data from the OCDS relational database. It performs risky transactions queueing as described by the methodology. This module allows users to change prioritisation settings and quickly get new results. The resulted analytical data is displayed via a web UI for the analysis and further processing.

1. Checklists module

This module allows auditors to create and tailor a checklist for contracting authorities and their transactions audit and supports the proper documenting and storage of the information collected during the audit.

User interface

The web UI is designed for auditors working with the results of the calculation of automatic risk indicators and with checklists. This web page consists of various information indicators, charts and tabular data that use the results of the calculation of automatic risk indicators and transactional public procurement data as data sources. It includes filtering tools to drill down on the displayed data in accordance with the requirements of the end-user. Also, part of the interface allows managing the checklists during the audit activities through the auditor’s workspace developed as a part of the web UI. .

#### Results and future expectations

As a result of the project, the new audit methodology for electronic public tenders was developed and piloted. The Kyrgyz Republic Chamber of Accounts now has a data-driven audit methodology and the public procurement data analytical infrastructure to support their audits. The methodology and the analytical tools enable a previously impossible level of risk analysis of procurement spending within the country and at various stages of the digital procurements, audit cycle and the eProcurement audit methodology are ready to be implemented in other EBRD countries.

In terms of the goals set for the project, the new audit methodology and analytical tool:

* provides a direction for data analytics application during the digital public procurement audit based on OECD guidance and international best practice, and
* enables the state audit institution to conduct the data-driven audit of public procurement transactions.

Deployment of an **OCDS-based set of online analytical tools for auditors** enables an analysis of public procurement data for audit purposes and to pilot methodology.

* **Provides risk assessment of the digital procurement transactions in the system** – by applying risk-indicators algorithms results calculated by the risk-engine
* **Provides risk assessment of the contracting authorities using the system** – by aggregating procurement transactions risk-indicators results in line with the designated methodology
* **Enables the automated generation of auditors’ checklist** – the functionality enables adjustment of the checklist for each audit and its’ objectives
* **Provides support for audit results evaluation by applying scoring functionality** – auditors can use the automated scoring to evaluate audit results gathered in a checklist and support their conclusions.

Going forward, the impact of the project could be increased by allocating resources and a budget to support the analytical capacity of the auditors to develop a new analytical hypothesis on risk identification and implement them into the digital environment. The tools and risk indicators now available require a periodic evaluation and need to be assessed for their relevance and effectiveness in a constantly changing environment. The risk information could be used to develop risk responses not just for audit purposes but for policymakers in their decisions across different policy fields.

#### Costs and requirements

The New Audit Methodology for Electronic Public Tenders was developed and piloted for a total cost of between **€250 000 – €300 000**. A significant amount of the budget was expended on the human resources inputs required to study the best practices of using procurement data in auditing, analyse the existing procurement processes and associated risks, then designing and developing a tailored set of risk-indicators, suitable for developed methodology calculation results presentation, and developing analytical tools needed to accommodate the above.

The **breakdown of costs** is roughly as follows:

* **Development of The New Audit Methodology for Electronic Public Tenders** – roughly **€150 000**. The main variables affecting this cost are related to researching existing practices, drafting of the methodology and its adaption for the needs of the pilot in the Kyrgyz Republic. In this case, an additional cost was incurred because of the need of consultants in Europe to work with counterparts located in a different part of the world to gather best practices from Latin America countries and localise it for the Kyrgyz Republic. The costs of similar projects in other countries could therefore vary considerably depending on efforts required to localise the model methodology into the applicable standard.
* **Development of the analytical tool** for auditors – **€100 000 – €150 000**. The main factors influencing the cost are the underlying quality of the data, and the number of risk indicators and analytical dashboards to be developed.

In terms of the **human resources required for the project**, the EBRD worked **with 3 separate consulting and technology firms** to develop the methodology and the analytical tool. Each of these firms provided expertise in different areas: one with specialist knowledge on the use of **risk management and auditing methodologies**; one with expertise in **risk-engine and** **web applications**; and another with expertise in **data analysis**.

Other key requirements to perform the project include the **existence of digital procurement systems** in the first place. However, similar projects can be performed with a wide variety of different types and standards of such eProcurement systems. As mentioned in the costs section above, however, systems with poorly organised databases and poor data quality will require considerably more time and expense to perform the necessary data transformation to OCDS and setting up functioning data analytics tools. A final key requirement to perform such a project is to **have access to local experts who can explain how the existing databases of the eProcurement are set up and what the data refers to**.

#### Risk and mitigation

At the start of the project, one of the risks identified relates directly to the point above – **access to the experts who could accurately describe the current state of the existing eProcurement systems** and databases. It was not known whether this would be provided, or whether for example, the team risked being provided with out-of-data information on the systems.

#### Challenges and lessons learnt

The main challenges for the project were related to securing the necessary support from the people and organisations to access the required systems, data, policies and regulations. It took some time to agree on the design of the risk indicators before their development and deployment. Significant time was spent in getting interim feedback from the key beneficiaries on project milestones achieved and managing their expectations on the projects interim results. This can be partially explained by the fact that this is a new concept, and the change management should be considered as part of future projects.

As a separate point, the design approach assumes the risk management framework is developed and employed for assessment, prevention and mitigation of risks throughout the public procurement cycle. This is not the case for the Kyrgyz Republic procurement sector. The Kyrgyz Republic procurement sector is missing clear risk management frameworks, strategies and implementation plans according to relevant international standards. The risk indicators are supposed to be an integral part of the comprehensive risk management framework; however, for this Project, they were developed outside of this framework as the risk management framework is not implemented for the public procurement system in the Kyrgyz Republic. .

Lessons that can be taken from the project include:

* **The underlying quality of the data is key** – a lack of a data source and the poor quality of data create major challenges for the implementation of the methodology. It increases the resources needed and pushes the project costs up and reduces the accuracy and reliability of the analytical tools available to the auditors. As a result there is a significant risk that the auditor’s trust in the tools that are developed can be seriously undermined.
* **Analytical capacity and human “know-how”** – the methodology and developed tools can only stay relevant if supported by the team of analysts who are able and willing to search on data, create hypothesises, test them and implement in relevant risk indicators.

* **Public procurements risk assessment process** – public procurement risk assessments should be targeted at the overall procurement system level before focusing on the identification of the risk at the procurement transaction level. The users of a risk assessment need to map out which risks are potentially the most damaging to the goals of public procurement. This is the primary question that needs to be addressed before moving to more granular identification of risks and mapping to the risk indicators at the transaction level. This is to ensure that the methodology and supporting tools developed will cover the most damaging risks throughout the lifecycle of the procurement transactions.
* **The methodology and supporting tools performance assessment** will drive further development. For the data-driven methodology and supporting analytical tools to work correctly, a feedback loop should be built into the application of the methodology linking back to the performance measurement of the methodology, analytical tools, risk indicators and the auditors’ efforts applied. Appropriately established performance management processes will support ongoing and effective improvements to the methodology and the supporting tools
* **Training and learnings –** training in risk identification, management, mitigation and communication are central to ensuring that KR CA audit practitioners understand risks in the public procurement cycle, the ways it can be controlled by applying the methodologies and technologies available and the attitudes and behaviours they need to effectively perform their roles. The purpose of training is to raise awareness of risks and mechanisms, to enable auditors and other stakeholders to identify and control them in their areas of responsibilities and to strengthen the public procurement cycle through adequate overseeing of potential risks.
* **Projects should be designed in several phases**, giving opportunity for the model methodology users to move through the analytics maturity levels naturally and consistently, providing support to grow with their capacity at each level.